VOL. XVI. No. 8.

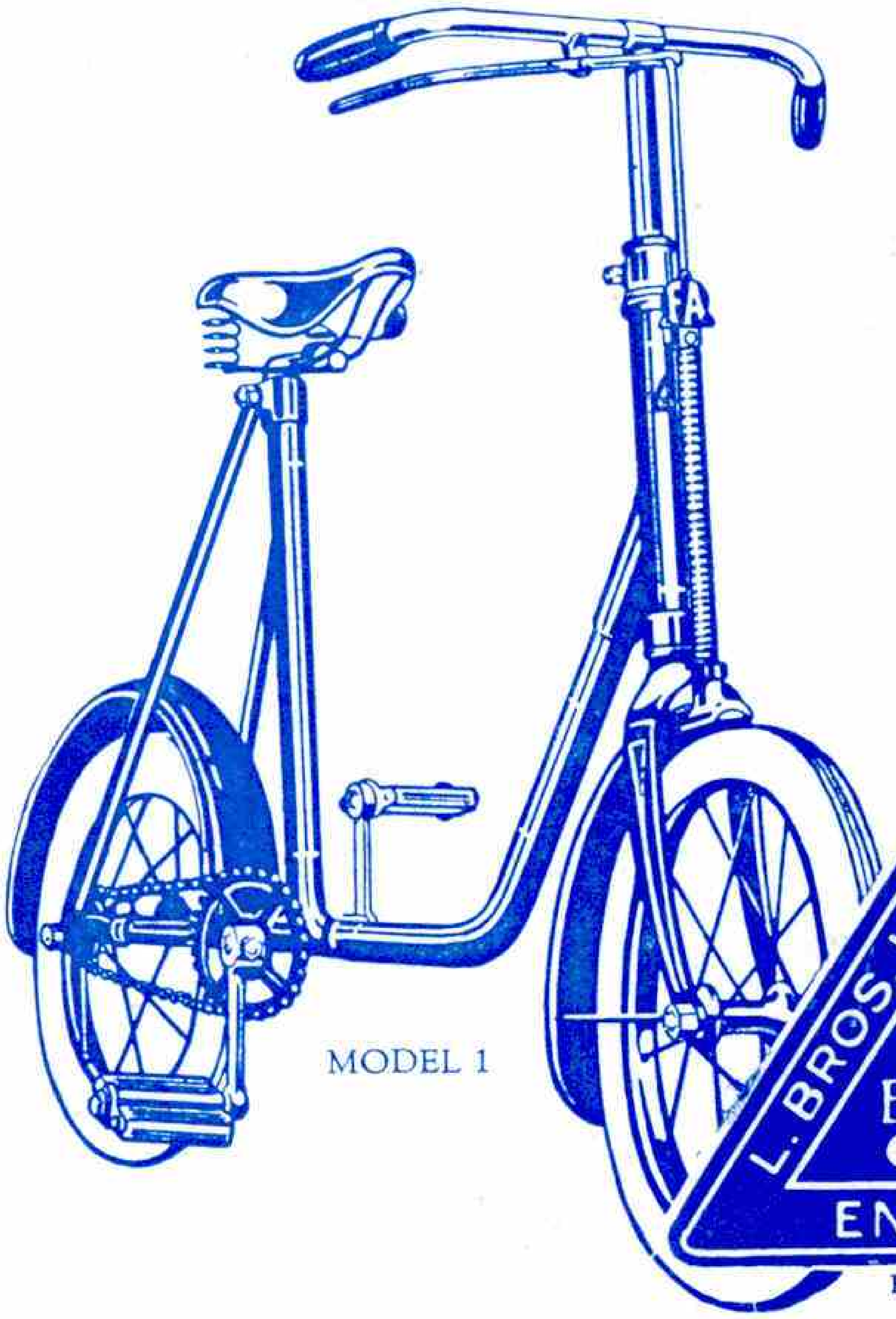
AUGUST 1931.

MECCANO MAGAZINE

FELLING FOREST GIANTS (see page 610)

Better looking bikes now than ever

" What makes a first-class bike ? " We flattered ourselves that we'd settled that question outright when we produced the first Fairycycle—as handsome and sturdy an engineering job as the keenest critic could require. But there's nothing hidebound about us. Every chance that has offered of improving the Fairycycle has been taken eagerly. The latest improvement is the greatest yet, for looks. Chromium plating ! You know that amazing untarnishable glitter, which never wears off ? On all but the junior models, chromium plating fittings are standard now.


MODEL 1

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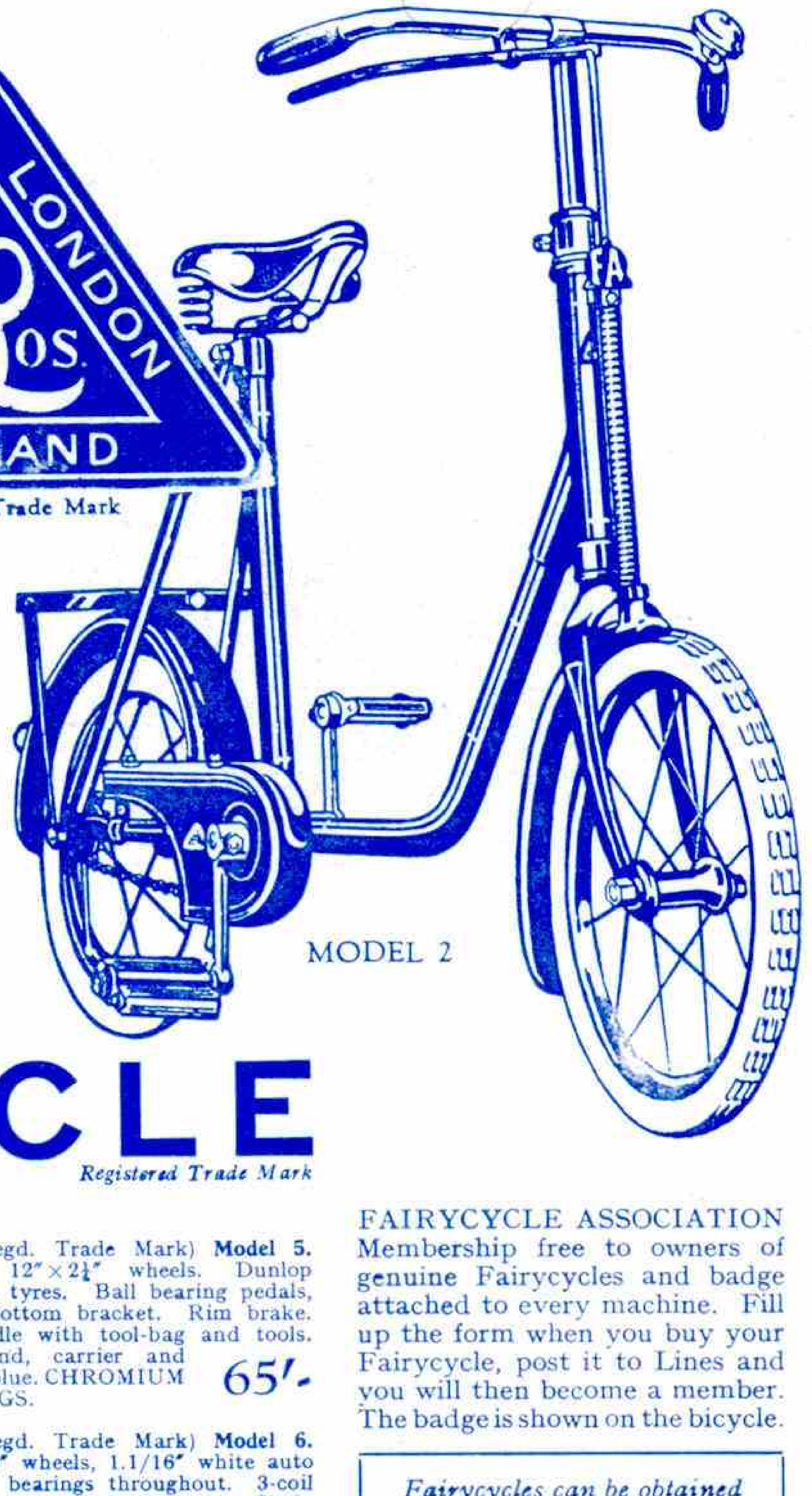
MODEL 2

FAIRYCYCLE (Regd. Trade Mark) **Model 1.** Tubular frame, 12″ wheels, ¾″ grey tyres, Spoon brake. Free wheel. Leather saddle. Black finish, N.P. bars and ball bearing pedals. 29/6

FAIRYCYCLE (Regd. Trade Mark) **Model 2.** Tubular frame, 14″ tangent spoke wheels, 1.1/16″ white auto tread tyres, ball bearing pedals, Spoon brake. 2-coil leather saddle, chain cover, stand and carrier, reflector and tools. Black or blue, nickel plated fittings. 39/6

FAIRYCYCLE

Registered Trade Mark

Besides the models specified above, Fairycycles are made in the following sizes at the prices stated :

FAIRYCYCLE (Regd. Trade Mark) **Model 3.** Tubular frame, 14″ wheels, 1.1/16″ white auto tread tyres. Ball bearing pedals and bottom bracket. Rim brake. 2-coil leather saddle. Chain cover, stand, carrier, reflector and tools. Black or blue. CHROMIUM PLATED FITTINGS. 49/6

FAIRYCYCLE (Regd. Trade Mark) **Model 4.** Tubular frame, 14″ × 1⅜″ wheels, Dunlop pneumatic tyres. Ball bearing pedals and wheels. Rim brake. 2-coil leather saddle with tool-bag and tools. Chain cover, stand, carrier and reflector. Black or blue. CHROMIUM PLATED FITTINGS. 55/-

FAIRYCYCLE (Regd. Trade Mark) **Model 5.** Tubular frame. 12″ × 2¼″ wheels. Dunlop pneumatic balloon tyres. Ball bearing pedals, head, hubs and bottom bracket. Rim brake. 2-coil leather saddle with tool-bag and tools. Chain cover, stand, carrier and reflector. Black or blue. CHROMIUM PLATED FITTINGS. 65/-

FAIRYCYCLE (Regd. Trade Mark) **Model 6.** Tubular frame, 16″ wheels, 1.1/16″ white auto tread tyres. Ball bearings throughout. 3-coil spring saddle with tool-bag. 2 rim brakes. Chain cover, stand, carrier and reflector. Black or blue. CHROMIUM PLATED FITTINGS, including rims. 59/6

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MECCANO MAGAZINE

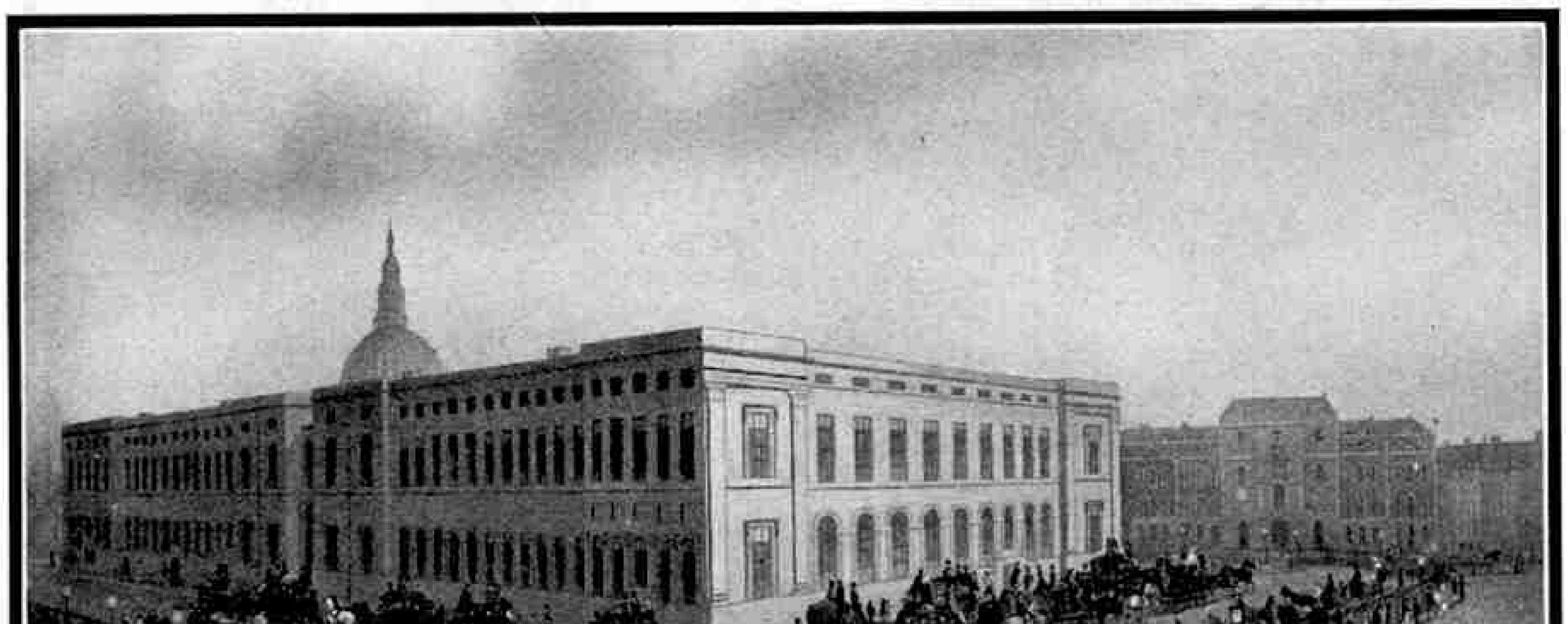
Editorial Office:
Binns Road
Liverpool
England

Vol. XVI. No. 8
August, 1931

With the Editor

The First Mail Coach in England

We are so accustomed to the smooth and rapid working of our postal system that we seldom give a thought to the wonderful organisation that makes this perfection possible. Almost the only occasions on which attention is drawn to the Post Office are those when something goes wrong, and indignant people write letters to the newspapers denouncing the Postmaster-General and all his ways!



The General Post Office, London, in 1832, showing the Royal Mail coaches and carts preparing to start.

The British postal system of to-day is the result of a long process of development from as early as the thirteenth century, when royal messengers were employed for the conveyance of the king's letters. By degrees there grew up a system of public messengers travelling on post-horses for the carrying of letters. A royal order of 1603 directed that postmasters should have the privilege of letting horses to those "riding in post," and they were therefore charged to keep in readiness a sufficient number of post-horses. This system with various changes prevailed for a surprisingly long period, the reason being that the state of the roads generally was so bad that post-horses provided the only reliable means of transport.

The postal conditions existing late in the 17th century are described by a writer of the year 1677. "The number of letters missive," he says, "is now prodigiously great. . . . A letter comprising one whole sheet of paper is conveyed 80 miles for twopence. Every twenty-four hours the post goes 120 miles, and in five days an answer may be had from a place 300 miles distant."

One of the greatest difficulties with which the Post Office had to contend in those days was robbery by highwaymen, and a further trouble was the slowness and uncertainty of the post-horse service. Delays were a regular occurrence, and business was seriously interfered with on account of the impossibility of relying upon letters reaching their destination at the proper time. In 1783 John Palmer, manager of the Bath Theatre, suggested that this state of affairs could be remedied by building mail-coaches specially designed to run at a good speed, by providing a reliable supply of good horses, and an armed guard for each coach. His suggestion aroused the opposition of the postal authorities, and it is quite likely that this opposition would have been too strong for Palmer, but his scheme was brought to the notice of William Pitt, then Prime Minister, who ordered that it should be tried. The running of an experimental coach between London and Bristol was commenced in August, 1784, and its success was immediate and complete. In a future issue I hope to commence a series of articles describing the wonderful story of the British Post Office and the part engineering has played in its development.

Round the World in Nine Days

Jules Verne seems to have been responsible for starting the fashion—mainly American—for record-breaking in round-the-world journeys. When his famous book "*Round the World in Eighty Days*" appeared in 1872, many people ridiculed the idea that the journey could be made in so short a time as that taken by Phileas Fogg, the hero of Verne's story, and in 1889 an American woman named Nellie Bly decided to settle the dispute by a practical demonstration. Following almost the same route as that taken by Fogg, she reached her starting point 72 days after her departure, and thus vindicated the great French writer.

Faster trains and steamships, and the introduction of aeroplanes, have enabled this time to be reduced considerably. By 1913 it had been brought down to 36 days, at which it stood until 1926, when two Americans, Wills and Evans, set out to reduce it. Twelve aeroplanes, three special trains, one motor car, several ocean liners, and many small boats and vehicles were pressed into service, and the route round the south coast of Asia, followed in most previous attempts, was abandoned in favour of one across Siberia. The travellers completed their journey in 28 days, 14 hours, 36 minutes.

In 1928 Mr. J. H. Mears and Captain Collyer left New York with the object of being the first men to beat the Moon, which travels round the Earth in 27 days. Travelling partly by air and partly by the swiftest available ships, they completed their journey in 23 days. They flew from New York in pursuit of the "*Olympic*," which had left the city several hours earlier, and boarded the vessel off the outermost lightship. On the completion of the Atlantic crossing they continued their journey in a monoplane brought from New York on board the liner. Travelling by air when possible, and crossing the Pacific Ocean on the swiftest available vessel, they completed their journey in 23 days.

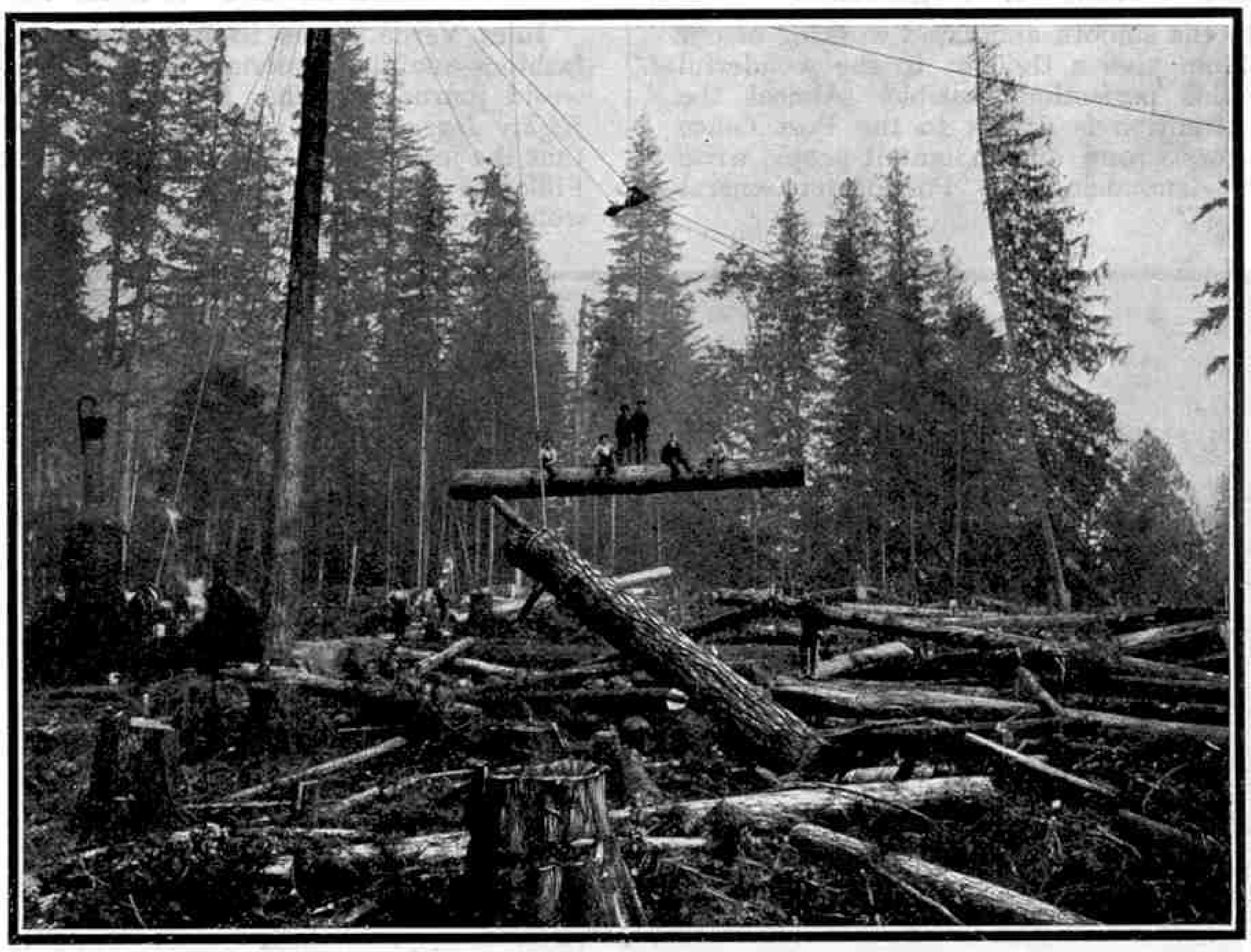
In 1929 the "*Graf Zeppelin*" completed a world flight in 21 days, 7 hours, 34 minutes, her actual flying time being 11 days, 33 minutes. Last month another American effort resulted in a record that is likely to stand for some time, although no doubt it ultimately will be beaten. Mr. Wiley Post and Mr. Harold Gatty left New York on 23rd June and arrived there again on 1st July, having circled the world in 8 days, 15 hours, 51 minutes, their actual flying time being only 4 days, 10 hours, 8 minutes. In view of this remarkable feat it is interesting to look back over the centuries to the year 1522, when the only surviving ship of Ferdinand Magellan's fleet, the "*Victoria*," struggled back to Spain after a voyage lasting just over three years, during which she had made the first circumnavigation of the world.

How the World's Timber Supply is Produced

1.—From Forest to Sawmill

In those parts of the world where it was plentiful, timber must have been the material used by man in his earliest attempts at building construction. The idea of the timber bridge would be suggested by the sight of trees fallen across narrow streams so as to provide a means of crossing. To-day we see the timber bridge in its highest form in the huge trestle bridges of North America which, however, are rapidly being replaced by steel structures. Timber also provided man with his first dug-outs and rafts. As ships developed through the centuries, the demand for timber for building them grew at a tremendous rate, and in the period immediately before the coming of steam and the iron ship it became so great that the supply of really suitable timber was inadequate. The day of the wooden ship has passed, but there has come into existence a new and ever-growing demand for timber for interior furnishings of buildings of all kind, for the making of paper, and more recently for the preparation of artificial silk. A large proportion of the world's timber is produced in North America, and in this article we shall describe briefly a typical Canadian lumber camp, and the progress of the timber from the growing tree to the sawmill.

Lumbering in Canada first began in the lower St. Lawrence area and the Maritimes. It extended to the Ottawa district, and from there to Georgian Bay and the spruce regions north of the prairies. Finally it spread to British Columbia, which now furnishes over half of Canada's lumber, although 20 years ago it provided less than one-fifth of the country's supply. To the pioneer, the forest was the central fact of existence, furnishing his house and fire, but effectively opposing his plough. Coming to the trading era, the first lumber shipped to Europe consisted of masts and spars for the French Navy. The historic square timber trade, of which so much has been written, had its headquarters in Quebec, reaching its height in 1864 when more than 1,350 vessels entered that port, carrying away over 20,000,000 cu. ft. When the sawn lumber trade and the deal trade developed the headquarters were moved to Montreal.



A scene at a lumber camp in British Columbia, Canada, showing the sawn logs being conveyed to the logging railway by means of an overhead wire-cable system.

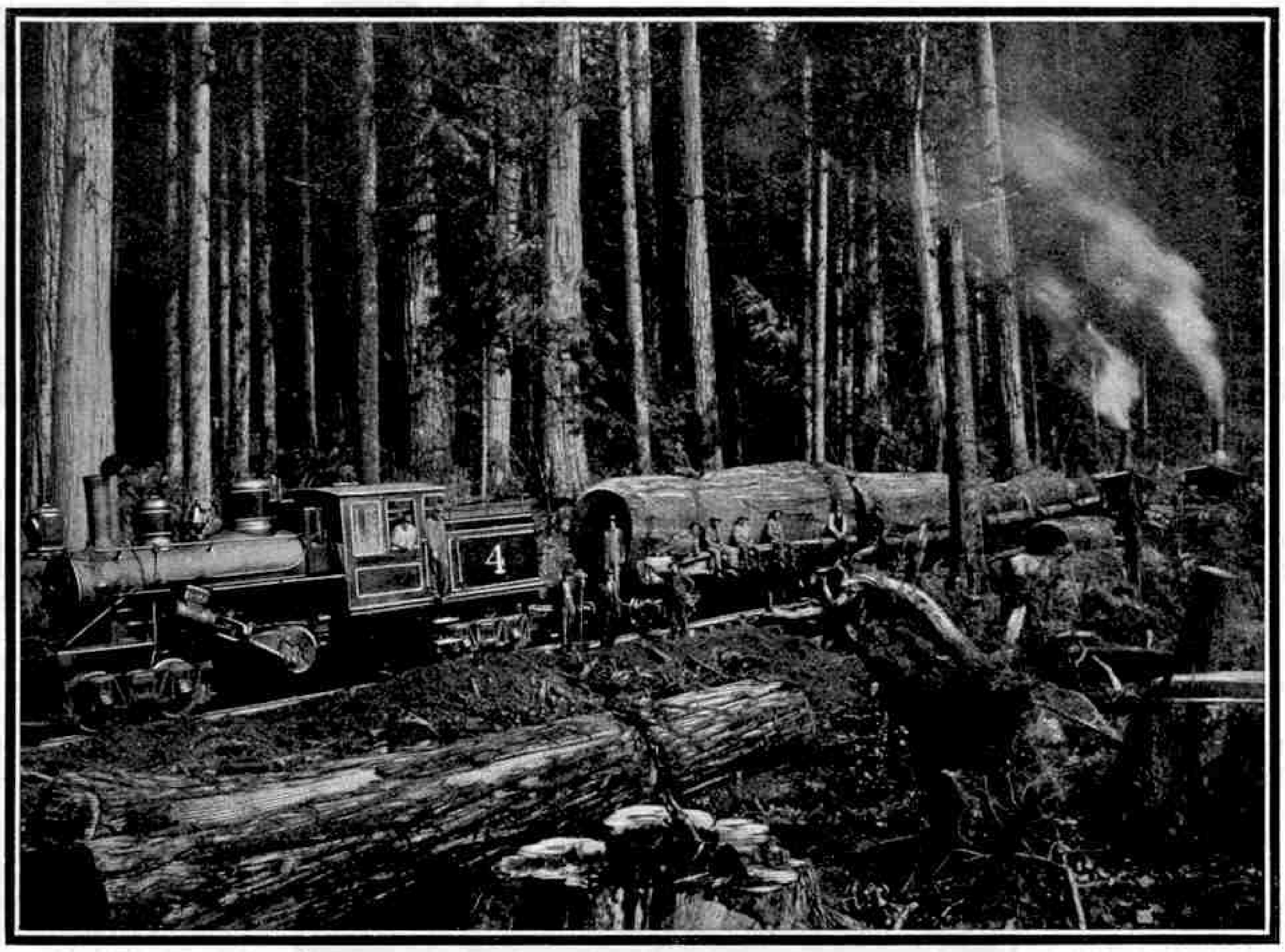
In Canada the logging season extends from late autumn until early spring. With the coming of the cold weather the gangs of lumbermen set off for the forests that are to be the scene of their labours during the following winter and spring. The first task of a gang on arriving at its destination is to establish a camp, and for this purpose sufficient trees are immediately felled to make a clearing or open space, if a convenient one does not already exist. In this limited area the log huts of the lumber camp are built. The largest of the huts is used to form the men's living quarters, and the bunks are arranged around the walls two or three tiers in height. The other huts include the mess room, at one end of which is a huge cooking range; the camp clerk's hut, and the store hut in which is kept a stock of tools, mackintoshes, heavy woollen underclothing, caps and many other items that go to make up the equipment of a lumber camp.

Strenuous days are spent in cutting down the giant trees with axe and saw, and trimming off the useless branches. The work is hard and calls for both skill and strength, but the life is healthy and full of romance, although there may not be quite so much of the latter as story books would have us believe!

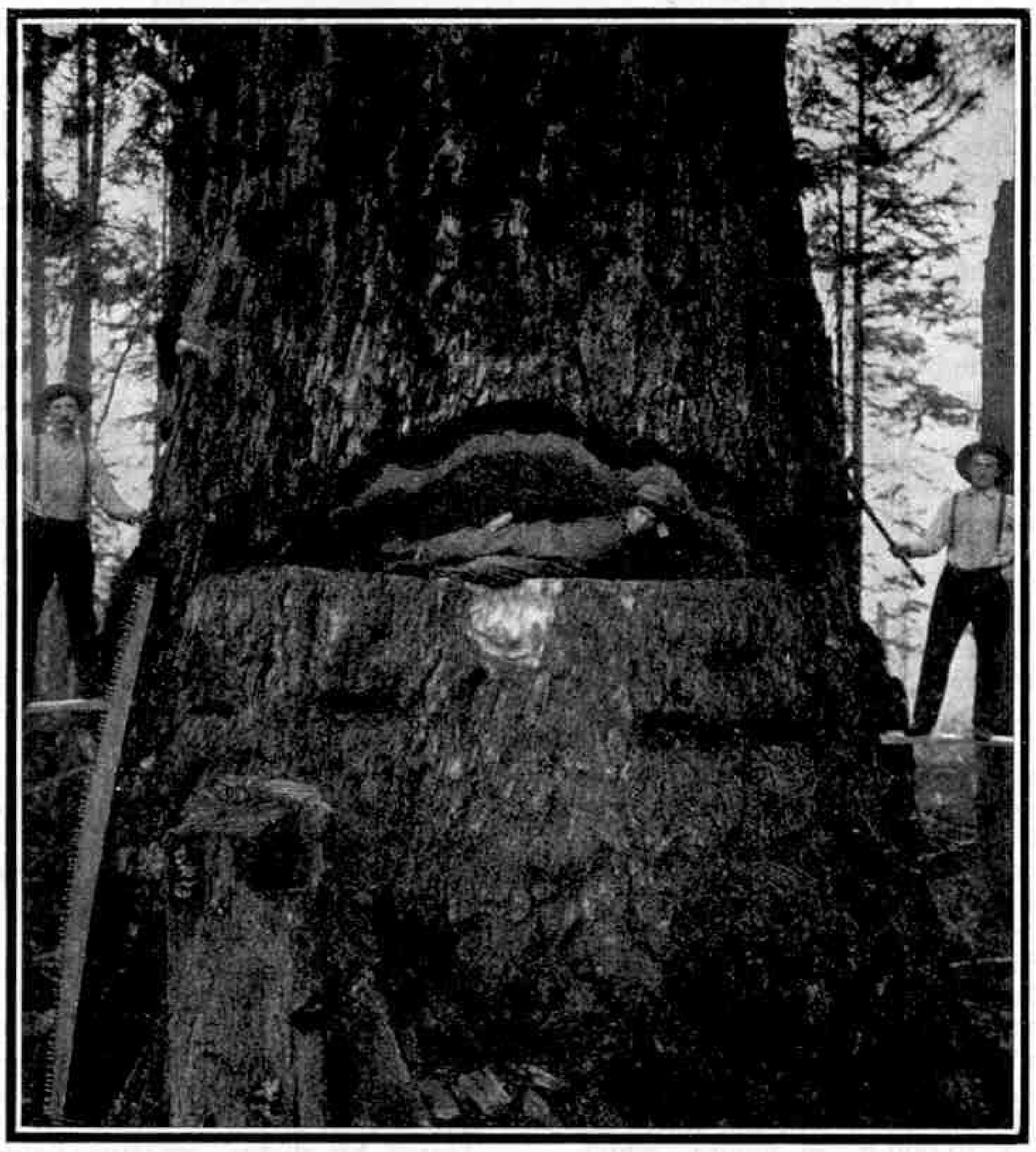
The camp is astir long before daybreak, and by sunrise the men have breakfasted and are on their way into the woods. The trees that are to be felled have been marked previously, and are indicated to the axemen or sawyers by a deep notch a foot or more in depth. It is most important that a tree, in falling, should not damage its own trunk or those of other trees, and the notch is always made on the side towards which the tree is intended to fall. When the tree has been felled the branches are trimmed off, and if it is to be sawn into "small stuff" the trunk is measured and cut into logs.

After trimming, the logs must be despatched to the sawmills, and the method by which this is done depends on the position of the logging camp. The camp may be conveniently near to a river or a long way from one, or it may be high up on the side of a mountain. Weather conditions also have an important bearing upon the methods employed at the camp.

One of the most popular methods is that of floating the logs down river to mills situated on the river bank. This of course cannot be done in winter when the rivers are frozen over, and until the thaw comes the logs are piled up on the bank of the river. When the ice breaks up and the floes move downstream, the timber is skidded into the water to follow them. The logs are carried down rapidly by the current, and if all goes well they reach the sawmill in a very short time. Rivers have bends and shallow stretches, however, and at times in these places a log becomes jammed in such a position that it obstructs other logs, and finally holds up the traffic completely. The lumbermen have to be constantly on the alert to prevent this from happening, for a big log jam is dangerous as well as being a nuisance. It acts as a dam for the rushing water of the river, and if it is not quickly removed it may cause a serious flood in the surrounding countryside.


A loaded train on the logging railway ready to depart for the sawmill. The logs are loaded one on each car.

In spite of every care, a jam now and then assumes serious proportions, and immediate and drastic steps must be taken to break it up. In the old days a lumberman wearing boots with long spikes went out across the pile of penned-up logs, the spikes giving him a precarious foothold as he leaped from one log to another. Using a long staff with an auger-shaped steel tip, he poked and pulled at the timber until he found the "key" log, that is the one that was holding up the rest. He then hooked this log firmly with his staff, gave it a powerful twist, and scrambled for his life to the bank. As the log came away, the whole pile would give a terrific heave and break up, the logs dashing headlong downstream. Sometimes the freeing of the "key" log caused such a swift and violent avalanche of timber that the lumberman failed to reach the bank in time, and was swept away to his death. The locating of the "key" log was sometimes only the work of a few minutes, but now and then a jam would resist the efforts of the entire driving crew for many hours.


The deep notch or "undercut" made in a fir tree that is about to be felled from the opposite side. Four feet above ground level the tree is 51 ft. in circumference.

Safer and more effective methods are now employed. If a jam cannot readily be dispersed, the lumbermen plant a few sticks of dynamite in the worst portions, light the fuse and then make for the bank. Quickly comes the explosion, fragments of logs fly up into the air, and if the dynamite has been well placed the logs are freed and once more renew their journey.

An interesting but not often used method of floating logs down to the sawmill is that of making them up into an enormous raft. The lumbermen make their home on this, and float with it many miles downstream. Some of these rafts are as long as 400 ft., and are from 65 ft. to 70 ft. in width. The task of navigating a raft of these dimensions is a most arduous one, and requires a crew of from 20 to 30 men who steer it by means of huge sweeps. A sweep consists of a pole 20 ft. or more in length, to the larger end of which is fastened a blade of pine 12 ft. in length, about 1 ft. in width, and an inch or two in thickness. The sweeps are used at the front and rear ends of the raft, each one fitting between a pair of oak pins that serve as rowlocks. With the aid of these sweeps the crew manage to steer the ungainly craft away from sandbanks and out of the track of steamboats.

It is not by any means easy to tie thousands of logs together in a really

(Continued on page 688)

EXPLORING THE ANTARCTIC

Famous Attempts to reach the South Pole.

VI.—BYRD'S FLIGHT TO THE POLE

IN a previous article in this series we described the expedition in which Captain Scott and four companions reached the South Pole, only to die on the Ross Barrier during a blizzard that overtook them on the return journey. While the members of Scott's expedition were still in the Antarctic, two other explorers were striving to penetrate further into the mysteries of the frozen South. One of these was Roald Amundsen, the famous Norwegian, and the other was Dr. Douglas Mawson, an Australian who had been a member of Shackleton's expedition of 1908.

Amundsen's presence in the Antarctic was unexpected, for he had been making preparations for an Arctic expedition. Inspired probably by Shackleton's brilliant exploit, described in the June issue of the "*M.M.*," Amundsen suddenly changed his mind and decided that he would make an effort to be the first to reach the South Pole. He gave no hint of this alteration in purpose until he reached Funchal, Madeira, the last port at which he proposed to call before reaching the Ross Barrier, where he intended to establish his winter quarters. He found a suitable position for a hut a short distance from the Bay of Whales, a great opening in the face of the Barrier, and there he and a few chosen companions spent the Antarctic winter of 1911.

Amundsen set off for the Pole in the following spring. He and his men were expert dog drivers, and they were favoured by good weather. They made excellent progress across the Barrier until they reached the mountain ranges that form its southern boundary. After a little trouble they found a way through these mountains up a great glacier, to which they gave the name of Axel Heiberg Glacier, and so attained the plateau on which the South Pole is situated. They reached their goal on 16th December, 1911, a month before Scott arrived there. The return journey was made practically without incident, the whole expedition being a triumph of careful organisation for the special purpose in view.

Dr. Mawson, the leader of the second of the two parties referred to, had no designs on the Pole. His aim was to effect a landing on the Antarctic continent at one or two points south of Australia in order to explore sections of which practically nothing was then known. Actually two parties were landed, one in Adelie Land, and the other about 1,500 miles farther east in what was afterwards called Queen Mary Land. Adelie Land had been discovered many years previously, but until Mawson actually landed on it, its position and even its existence had been regarded as uncertain.

Behind the quarters taken up by both sections of Mawson's expedition stretched a land covered with snow and ice that rose gradually to form a plateau, about 10,000 ft. in height, which probably continued as far as the Pole itself, 1,700 miles away. Owing to the very low temperature prevailing, an immense mass of cold air accumulates above the plateau, which therefore acts as a gathering ground for the wind. The cold air streams out northward, to roar off the plateau in terrific blizzards. Throughout the winter, gusts of 100 m.p.h. or even more were common at Mawson's headquarters. Wind speeds of 80 m.p.h. to 100 m.p.h. were often maintained for days at a time, and a wind of 40 m.p.h. to 50 m.p.h., which in this country would be described as a moderate gale, came to be regarded as almost a dead calm!

Admiral R. E. Byrd, of the U.S. Naval Air Service, who has flown over both Poles. He reached the North Pole in 1926 and the South Pole three years later.

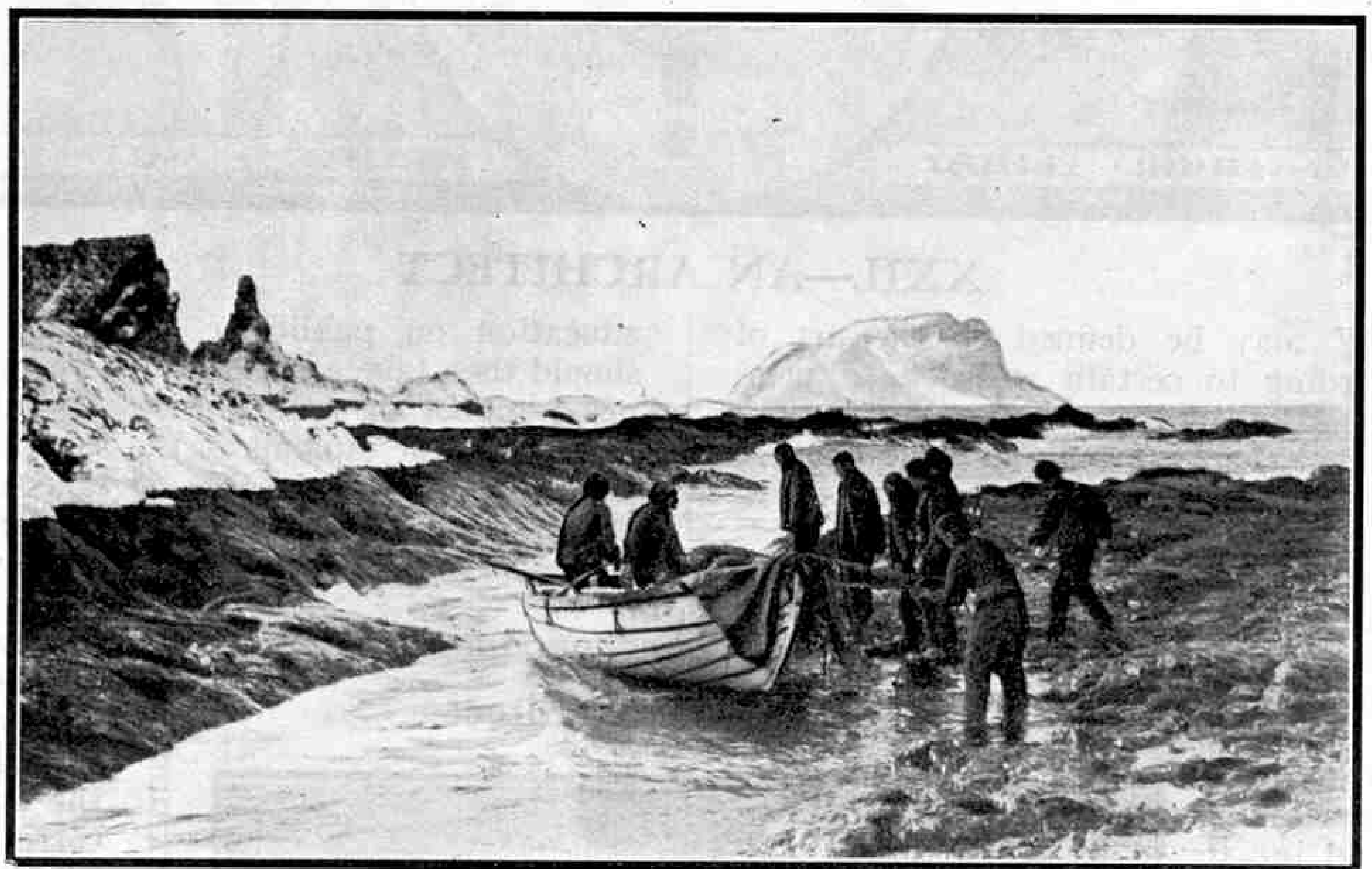
At first the explorers could only make progress against the wind by crawling on their hands and knees, but gradually they became accustomed to the conditions and learned the art of walking against the wind by leaning on it, strong spikes being fixed to their boots in order to give them a firm foothold. In strong gusts they appeared to be walking almost horizontally.

The splendid work of the expedition was marred by a tragedy in which two members lost their lives. These were Lieut. Ninnis and Dr. Mertz, who accompanied Dr. Mawson on a long sledge journey eastward. While travelling through a heavily-crevassed district, Ninnis and the sledge carrying the bulk of their food fell through a frail snow bridge across which his companions had already passed. A slight whimper from one of the dogs was the only indication that there was anything wrong, and Mawson and Mertz were horrified on looking back a few moments later to realise that their comrade has disappeared. They spent hours shouting down the crevasse and lowering weights and ropes in the hope that Ninnis would be in a position to reply or to make an effort to reach the surface. Eventually they were compelled to abandon all hope, and with it the possibility of proceeding further.

After reading a short service over the crevasse down which Ninnis had fallen, the survivors turned homeward. They were on short rations, and were compelled to eke out their scanty supplies by killing and eating their famished dogs. They steadily became weaker as they toiled slowly westward, and eventually Mertz died from exhaustion. Mawson struggled onward alone, often miraculously escaping death while crossing crevassed areas, and eventually he staggered into the view of the anxious men awaiting his return to the hut.

Dr. Mawson's expedition may be described as the last that was conducted on the lines made famous by such great men as Scott and Shackleton. The War prevented further expeditions for many years, and now that interest in the Antarctic has again revived, a new means of travel is at the disposal of explorers, in the aeroplane. Travel by sledge, whether hauled by men or dogs, is slow and arduous, and the necessity for taking food supplies for long periods greatly restricts the operations that can be carried out in this manner. An aeroplane can cover as much ground in a day as would require two or three months if reliance were placed only on dogs or on man-hauling. In addition, exploration by air is carried out under more comfortable conditions, and the necessary records may be made quickly and accurately by means of aerial survey cameras, instead of by laborious measurements of distances and angles.

One of the first to use aircraft in Polar exploration was the American, Commander—later Admiral—Byrd, who in 1926 flew to the North Pole and back from Spitsbergen. Sir Hubert Wilkins, the Australian explorer, also made good use of aeroplanes in the Arctic, notably in a great flight from Alaska to Spitsbergen. Wilkins then turned his attention to the Antarctic, and in a series of flights over the land west of Weddell Sea proved that Graham Land was actually cut in two by a frozen strait, a fact that previous explorers by land had failed to discover. Sir Douglas Mawson, who had been knighted for his services to Antarctic exploration, also discovered new land by means of a seaplane that he took with him on his second expedition, from which he returned early this year; but the most successful efforts to explore the frozen South by air were made by Commander Byrd, who followed up his success in the Arctic by flying over the South Pole.



A bleak scene in the Antarctic. Members of the "Endurance" expedition, led by Sir Ernest Shackleton, landing on the desolate shore of Elephant Island. For this photograph we are indebted to the courtesy of Lady Shackleton.

Byrd went south at the head of a very large expedition and established winter quarters on the icy shores of the Bay of Whales, near the site occupied by Amundsen nearly 20 years earlier. The wooden huts that sheltered the expedition formed almost a village, to which the name Little America was given; and there preparations were made for surveying the surroundings of the camp from the air, as well as for a flight to the South Pole itself.

The discovery of Amundsen's tent at the South Pole by Captain R. F. Scott, R.N. From left to right the figures shown in this illustration are Captain R. F. Scott, R.N., Captain Oates, Dr. Wilson, and P. O. Evans. The photograph was taken by Lieut. H. R. Bowers, the fifth member of Captain Scott's party, and is reproduced by permission from "The Great White South," by Herbert G. Ponting, F.R.G.S. (Duckworth & Co., London. 7/6).

Byrd had with him three machines, all monoplanes. They included a Fairchild folding wing machine, and a Fokker Universal monoplane, both of which were equipped with 425 h.p. Pratt & Whitney "Wasps." The largest of the three, and the one intended for use on the Polar flight, was a Ford all-metal monoplane. This was chosen because it had three engines and was capable of flying with one of them out of action. Two Wright "Whirlwinds" were fitted under the wings, and the engine placed in the nose of the machine was the recently-designed 525 h.p. Wright "Cyclone." The total power available from the engines was about 1,000 h.p., giving the machine a maximum speed of 122 m.p.h. and a cruising speed of 110 m.p.h. to 116 m.p.h. All three aeroplanes were equipped with skis in order to enable them to rise from snow-covered ground, the exact form of these having been settled after careful tests in Northern Canada.

A second important weapon now at the disposal of the explorer is wireless. Byrd fully realised this, and had with him five wireless engineers. A wireless station was formed at Little America, the equipment being sufficiently powerful to enable regular communication to be kept up with stations in the United States. The three aeroplanes, and even the sledges to be used by exploring parties travelling over the Barrier, were also equipped with wireless sets. When active work began in the spring, therefore, the various detachments were in touch with each other as they moved about.

The advantages of wireless were realised shortly after the arrival of the expedition in the Antarctic, for a violent storm wrecked the Fokker while it was in the mountainous country west of the Barrier. In one terrific gust of wind the machine was torn loose from its fastenings, and flew backward for half a mile before crashing on the ice. An account of the disaster was rapidly transmitted to headquarters by the wireless operator and the explorers thus stranded were rescued by Commander Byrd himself, who flew to pick them up in the Fairchild monoplane.

The greatest flight of the expedition was of course Byrd's trip to the South Pole. A preliminary flight southward was made in the Ford in order to lay down a depot at the foot of the mountains that form the southern boundary of the Ross Barrier. Several of these mountains rise to heights of more than 10,000 ft., and they were Byrd's principal obstacles on the way to the Pole. The actual Polar flight began on 25th November, 1929, that day being chosen because the meteorologists considered there were excellent prospects of fine weather. It is interesting to note that at that moment a sledging party was approaching the mountains, and that they also reported by wireless that the atmosphere was clear and conditions generally were favourable.

In the cabin of the Ford as it flew southward were three men, Byrd himself, who acted as navigator, June, the wireless operator and assistant pilot, and McKinley, who was in charge of the survey camera with which photographs were constantly taken throughout the flight. In the pilot's compartment was Balchen, the chief pilot of the expedition, who had already made important flights with Byrd, including one across the Atlantic Ocean. The flight followed Amundsen's route to the Pole and charts were spread out on a table in front of Byrd. He had at hand the photographs taken by Amundsen, together with that explorer's account of the various landmarks that were to be seen on the way to the Pole, and he was in constant touch with Balchen, who followed the course set for him by his commander.

An exciting moment came when the crossing of the mountain range began. Byrd decided to fly up Liv's Glacier, a broad highway to the Polar plateau farther west than the Axel Heiberg Glacier up which Amundsen had travelled. The aeroplane roared upward, climbing higher in order to

(Continued on page 631)

What shall I be ?
DRAUGHTSMAN • CUSTOMS OFFICER • CHEMIST
SURVEYOR • ACCOUNTANT • CIVIL ENGINEER

XXII.—AN ARCHITECT

ARCHITECTURE may be defined as the art of building according to certain well-defined principles of proportion and symmetry, so that an edifice when completed shall not only suit the purpose for which it was erected, but at the same time form a harmonious whole.

This art undoubtedly originated in man's necessity for a protection from climatic conditions. There is ample evidence to show that in prehistoric times in northern and in tropical climates the inhabitants lived in underground dwellings and caves ; in temperate regions in huts, and in warm countries in tents. A study of the architecture of each country and race shows that the differences in design are due largely to climatic influence, to the warlike and religious feelings of the people, and to the variety and amount of material at their disposal.

Notable examples of ancient architecture are to be found in India, Mesopotamia, Egypt, Asia Minor and Greece, where races that are now extinct, or have fallen behind, erected many wonderful buildings, the ruins of which show how magnificent they were. Later came the Roman style of architecture, and this in turn was followed by the development in Western Europe of the Gothic and other styles. Many splendid examples of Gothic architecture are still in existence, for it was largely employed by the cathedral builders of the later Middle Ages, and much of the best in modern architecture is based on this style.

To-day the architect has to cover a very wide range of subjects, and a long and intensive training is necessary to prepare him to carry out efficiently his varied duties. In preparing for entry into the profession it is customary for a boy to secure at least a matriculation certificate as a guarantee that he has received a sound general education on public or secondary school lines. He should then take a three or five years' course at a recognised school of architecture, and during that period qualify for the diploma of the Royal Institute of British Architects. If he is able to take a university degree he should most certainly do so, for by following this course he is more likely to acquire the wide outlook on the profession that makes a successful architect. A degree is not necessary, however, and the essentials for the success of the future architect's career are well supplied by the training given at any of the recognised schools of architecture. There are many excellent schools in this country from which to make a choice. Several of these are associated with universities, and there are also facilities for advanced studies at the Royal Academy Schools and similar institutions.

A Famous Architect

Sir Giles Gilbert Scott, R.A., F.R.I.B.A., became famous at the age of 21, when his plans for the proposed cathedral at Liverpool were given first place in a competition open to architects throughout the country. When the actual building commenced, Sir Gilbert was appointed joint architect, and he has watched over the erection of the cathedral for 28 years, during which time more than half of it has been built.

Sir Gilbert has carried out many other important architectural schemes chiefly of an ecclesiastical character. He has been engaged in restoration work at Chester Cathedral, and has designed new buildings for colleges at Oxford and Cambridge, in addition to a large number of churches in various parts of the country. He became R.A. in 1922, and was knighted by the King in 1924, when the first completed portion of Liverpool Cathedral was consecrated.

In recent years the established schools of architecture have been encouraged and fostered by the Royal Institute of British Architects and the Society of Architects, the two professional bodies that have been formed to safeguard and promote the interests of architecture. The first of these institutions is specially interested in the education and professional training of architects, and it should be the aim of every student to obtain as soon as possible the certificate of Associate of the Royal Institute of British Architects, signified by the abbreviation A.R.I.B.A. In order to do this it is necessary to pass certain examinations held by the Institute. Partial exemption is granted to students who have completed satisfactorily the course of training at recognised schools and have obtained certificates and diplomas awarded on the result of their work.

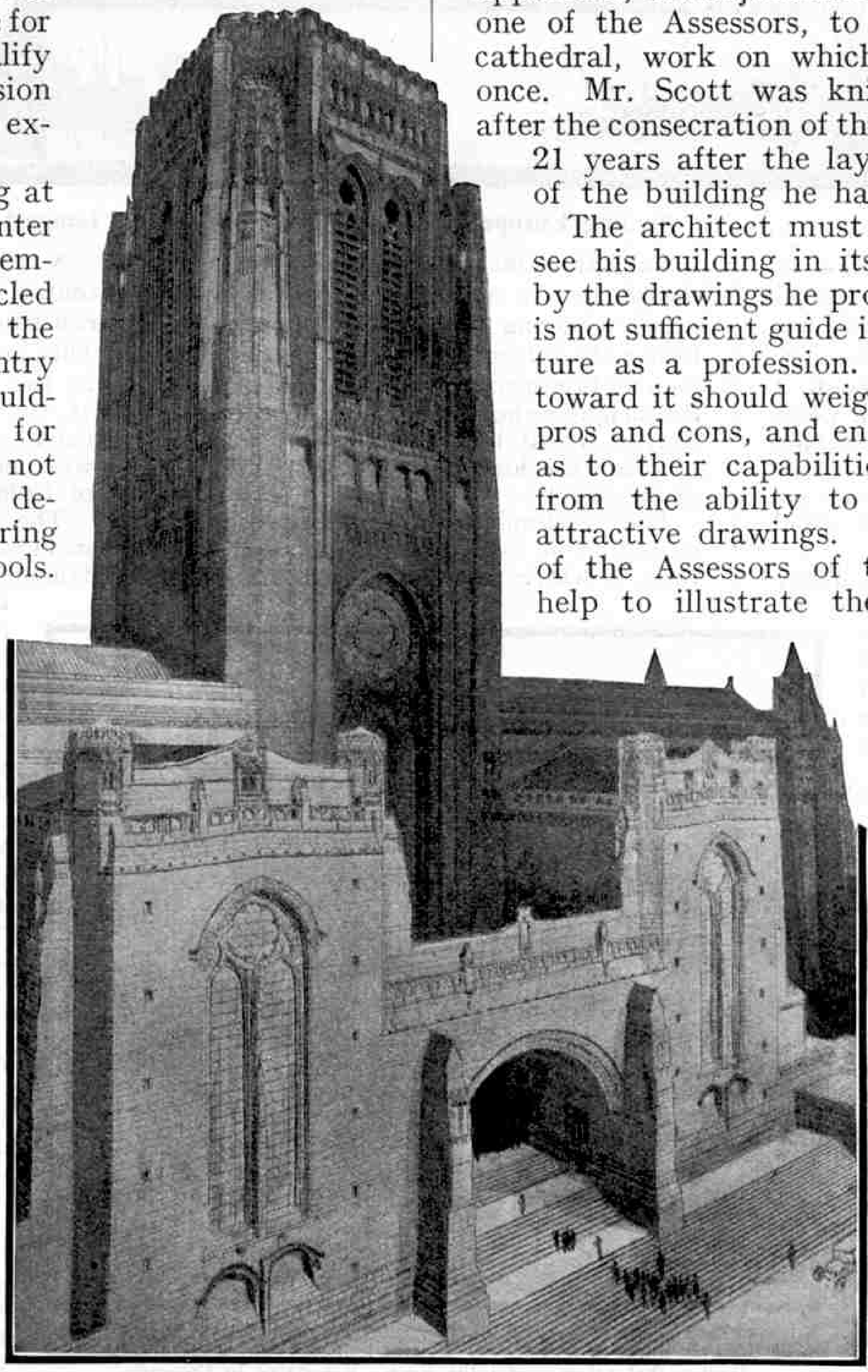
Full details of the schools recognised for this purpose, and of the training offered by them, are given in a pamphlet issued by the R.I.B.A. This may be obtained on application to the Secretary, Royal Institute of British Architects, 9, Conduit Street, London, W.1., enclosing a remittance of one shilling.

There are many scholarships open for competition among young architects. Some of these are tenable at the architectural schools, and others enable brilliant students to complete their training both in this country and abroad. With the aid of these scholarships it is possible for a really clever student to qualify for the architectural profession without incurring any great expense.

The alternative to studying at a school of architecture is to enter the office of an established member of the profession as an articled pupil. Formerly this was the only available means of entry into the profession, and the would-be architect paid a premium for the privilege. The practice is not encouraged to-day, and is declining, the profession favouring the training at recognised schools.

The student who has received a thorough training in a school of architecture will be well advised, before thinking of setting up in practice for himself, to gain some experience in an architect's office as to office routine and business methods, so that he may be better equipped to deal with and advise future clients who may entrust him with business.

Every opportunity ought to be taken to visit works in progress; indeed, a period of employment as clerk of works is an excellent means of getting a closer insight into practical building work. It is most helpful in actual office routine, especially in the matter of detailed drawings and procedure generally.



The transepts and central tower of the Liverpool Cathedral as they will appear when the work of erection is complete. This drawing of a portion of Sir G. G. Scott's masterpiece is by Mr. T. Raffles Davidson, and is reproduced by permission of the Liverpool Cathedral Committee.

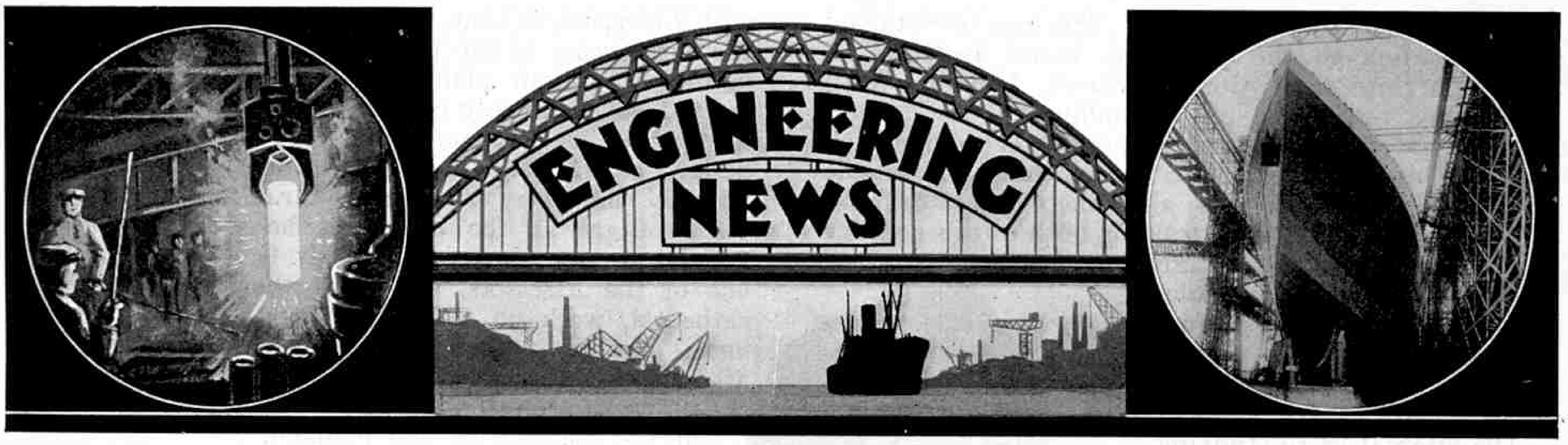
The success of an architect depends very largely upon his initiative and his skill as a designer. If he starts on his own account it may mean a lean time for a few years, but if he is a plodder and is prepared to tackle competitive work, he will sooner or later find himself successful in pulling off a job that gives him a good start, and from which other commissions are sure to follow.

Many interesting stories are told of amazing successes of young architects. One notable case was that of Mr. H. L. Elmes, who at the age of 24 was appointed architect for that magnificent building St. George's Hall, Liverpool, one of the finest examples of classic architecture in the world. A more recent and even more remarkable example of success, also associated with Liverpool, is that of Mr. Giles Gilbert Scott. In the early years of the present century architects were invited to submit plans for a great cathedral to be erected on an already chosen site; and the architects who acted as Assessors unhesitatingly accepted the designs of Mr. Scott as being the most satisfactory of all those that were submitted. Mr. Scott was only 21 years of age at the time, but he was immediately appointed, in conjunction with Mr. G. T. Hodley, R.A., one of the Assessors, to act as the architect of the cathedral, work on which was commenced almost at once. Mr. Scott was knighted by the King in 1924 after the consecration of the first portion of the cathedral, 21 years after the laying of the foundation stone of the building he had planned.

The architect must be a man of vision, able to see his building in its finished form as illustrated by the drawings he produces. Mere drawing ability is not sufficient guide in making a choice of architecture as a profession. Those who feel attracted toward it should weigh up in their own minds the pros and cons, and endeavour to satisfy themselves as to their capabilities in other directions, apart from the ability to make pretty sketches and attractive drawings. An extract from the report of the Assessors of the Liverpool Cathedral will help to illustrate the qualities demanded of an architect in the design of an important building.

"We had to look," they said, "to the real effect of the building rising to its final completion, at the dimensions and proportions of the different parts. We had to look at the practicable and feasible aspects of the design, we had to look for sufficiently original conception, we had to look for a fine and noble proportion combined with an evident knowledge of detail; lastly we had to look for that power combined with beauty that makes a great and noble building."

The average architect's practice covers a very wide range. He may be called upon to design anything from a humble cottage to a mansion, a gigantic block of offices, a magnificent hotel, or a great public building. He may even be asked to plan a city, and advise as to the design of the chief buildings so as to produce one harmonious whole. Town planning has made great strides in this country during recent years, but the chance to lay out an entirely new city is a rare occurrence. An outstanding example of such an opportunity was the creation of New Delhi, the wonderful modern city outside the historic capital of India. This was laid down by the famous English architect Sir Edwin Lutyens, R.A., who also designed the Viceroy's House and some of the principal buildings. The secretariat buildings, assembly hall, and other portions of the structure were designed by Sir Herbert Baker, R.A., F.R.I.B.A.

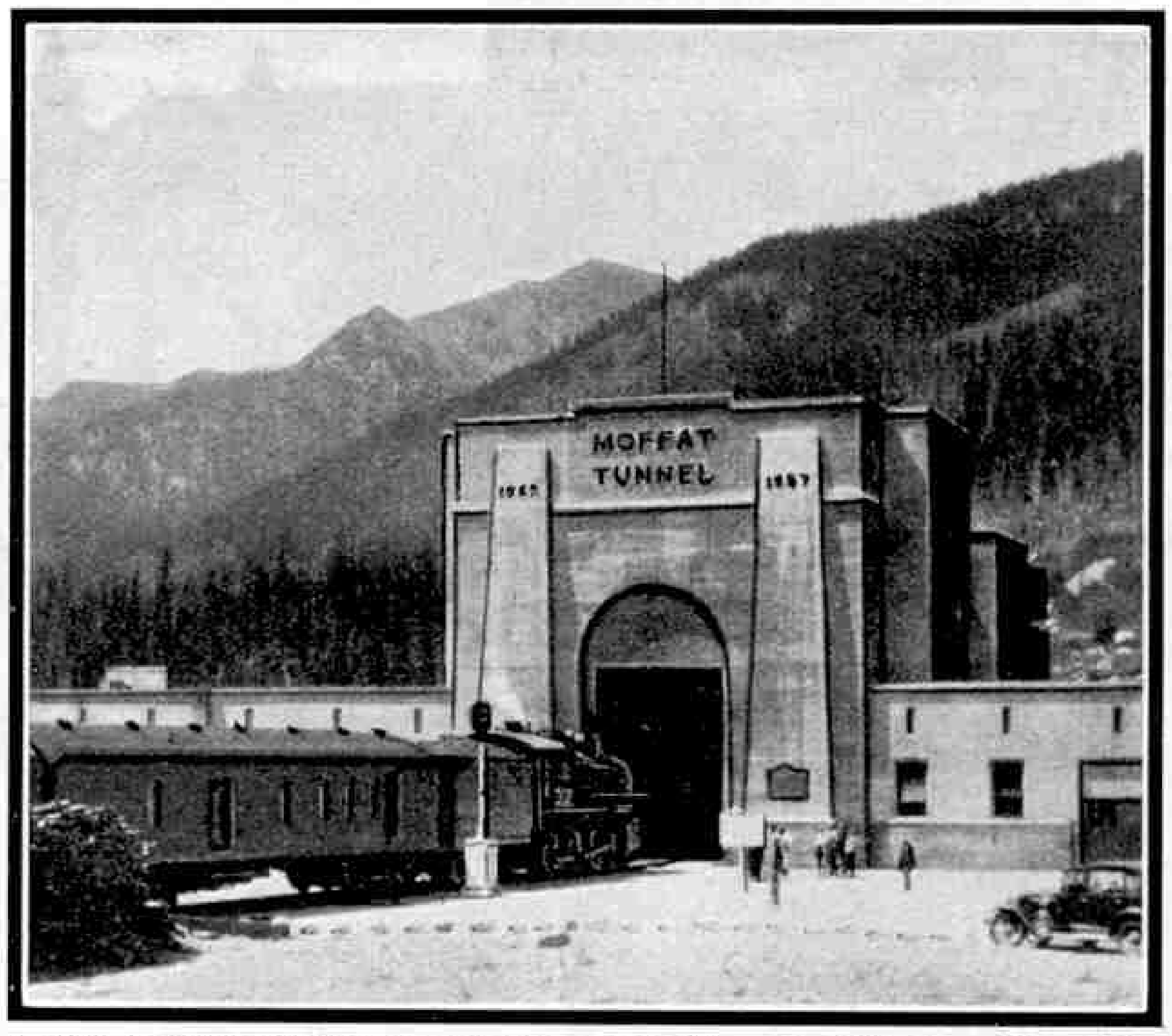


The Moffat Tunnel

On this page appears an illustration of one of the entrances to the Moffat Tunnel under Mount James, in the Rocky Mountains, Colorado. This tunnel is a little more than six miles in length and through it runs the railway from Denver to a point 255 miles westward. The main tunnel is 24 ft. in width by 16 ft. in height. It is at an elevation of 9,190 ft. above sea level, and there are 2,400 ft. of solid granite above its highest point.

The building of the Moffat Railway and of the tunnel now completed has been described as the last of American railway romances. The originator of the scheme was David Moffat of Denver. Nearly 30 years ago the way westward from Denver was barred by the Rockies, and travellers by railway from the city to the coast were compelled to make lengthy detours to the north or south. Moffat decided to build a railway over the mountains from Denver to Salt Lake City. The line crossed by a pass 11,600 ft. above sea level and the gradients and curves were very severe. Traffic was hindered by heavy snowfalls and in spite of the constant use of snowploughs the line was impassable for from 30 to 60 days every year. The use of the new tunnel avoids trouble due to weather conditions, and in addition, replaces a difficult circuitous route by an easy one 23 miles shorter.

The Moffat Tunnel cost nearly £4,000,000. Construction was commenced in 1923 and the first train passed through it five years later. The tunnel gives easy access to a large area rich in mineral wealth.



A train about to enter the portal of the Moffat Tunnel. This tunnel is a little more than six miles in length, and is on a railway line running west from Denver that passes under the Rocky Mountains in Colorado.

House Built of Steel and Aluminium

A new type of house called an "Aluminaire" has been designed by two New York architects. It is constructed entirely of metal and glass. The framework consists of beams and girders of aluminium and steel, and the walls, which are 3 in. in thickness, are covered with sheets of aluminium that is corrugated in order to avoid glaring reflections. Heavy supporting outside walls are unnecessary, and the light walls used are suspended from cantilever beams supported by slender aluminium columns. The windows therefore may be larger than in ordinary houses, and one side of the living room actually consists of a single piece of glass 17 ft. in length. The glass employed throughout is of a type that allows the passage of ultra violet light. The floors are of light steel covered with rubber and aluminium.

Pooling Europe's Electrical Resources

An interesting scheme for linking the electric power stations of the Continent is now receiving the attention of engineers. Under the scheme the energy produced in each station usually would be consumed in the neighbourhood, but a surplus in one district would be transmitted to another in which the load is temporarily in excess of the supply.

The preliminary plans suggest the formation of five great transmission lines, three of which would run north and south and two east and west. About 6,000 miles of additional high tension transmission lines to carry current at 388,000 to 400,000 volts would be necessary in order to complete the great network contemplated.

Rebuilding Chelsea Bridge

Chelsea Bridge is to be rebuilt in order to make it suitable for all classes of traffic. The bridge was opened in 1858 and is an iron structure of the suspension type. The roadway is 29 ft. 4 in. in width, narrowing to 22 ft. 5 in. near the supporting towers, and the bridge can only be used by vehicles weighing less than 5 tons.

The new structure also is to be a suspension bridge and will have two short approach spans. The central carriage way will be 60 ft. in width, giving room for six lines of traffic, and there will be two footways, each 12 ft. in width for the use of pedestrians. The estimated cost is £659,250.

Longest Concrete Arch in the United States

A reinforced concrete bridge with a central arch 425 ft. in length is now being constructed near Pittsburgh, Pennsylvania. This arch will be the longest of its kind in the United States. The total length of the bridge will be 1,510 ft., and its height 200 ft., while the roadway will be wide enough to accommodate four lines of traffic.

The new bridge is being erected as a memorial to George Westinghouse, the famous inventor. Westinghouse is chiefly known as the inventor of the air brake that bears his name, but during his lifetime he took out no fewer than 400 patents, an average of one in every six weeks, and was largely responsible for the wonderful development of the electrical industry during the second half of the 19th century. The headquarters of the Westinghouse Electrical Company, which he founded, are at Pittsburgh, and in addition to the bridge, a memorial to the great inventor has been erected in Schenley Park in that city. This was described on page 467 of the "*M.M.*" for last June.

The bridge will have five reinforced concrete arches of the open spandrel type. In its erection 73,350 c. yds. of concrete will be used, and the weight of the steel employed will be about 165 tons.

Electric Crane of Novel Type

An electric crane that is able to rotate round its load and to make a complete turn within its own wheel base has been designed and manufactured by Herbert Morris Ltd., Loughborough, for the L.N.E.R. The wheels of the crane may quickly and easily be set to enable it to move forward, backward, or sideways, or to carry out the movements already referred to, and it is claimed that the use of the new crane has resulted in a considerable saving in time during loading and unloading operations.

The crane is known as the "Versatile" model. It is capable of dealing with loads of 5 tons at a distance of 9 ft. 7½ in. from the centre of its turning circle. The jib may be extended to cover a radius of 18 ft. 4½ in. but then 1¾ tons is the maximum load. With the jib set at the ordinary radius, the crane has a lift from 10 ft. below ground level to 20 ft. above, but when the extended jib is in use the range is from 22 ft. below the surface to only 8 ft. above it.

The crane is fitted with a self-contained power plant, and current may be supplied by a generator driven by a petrol engine or from accumulators.

Hammerhead Crane to Lift 250 Tons

An electric hammerhead crane capable of dealing with loads up to 250 tons has recently been constructed and erected at the naval yard at Newcastle-on-Tyne of Vickers-Armstrongs Ltd. A small auxiliary crane to handle loads up to 20 tons is included in its equipment. The crane is carried on a foundation consisting of four cylinders, each of which measures 18 ft. in diameter. These are sunk to a depth of 78 ft. below the quay level and the crane was built on them by means of a Scotch derrick erected upon a steel staging 100 ft. in height. The auxiliary crane was installed at an early stage and also used during the work of construction.

The crane lifts 250 tons at a radius of 105 ft. Smaller weights may be handled at greater distances from the centre of the base, the maximum radius being 184 ft., at which loads of 100 tons may be lifted. The rate at which the crane's greatest load may be hoisted is 3 ft. 6 in. per minute, and loads of 100 tons may be dealt with at a speed of 9 ft. per minute. With a load of 250 tons on the hook, the crane may be slewed completely round in ten minutes.

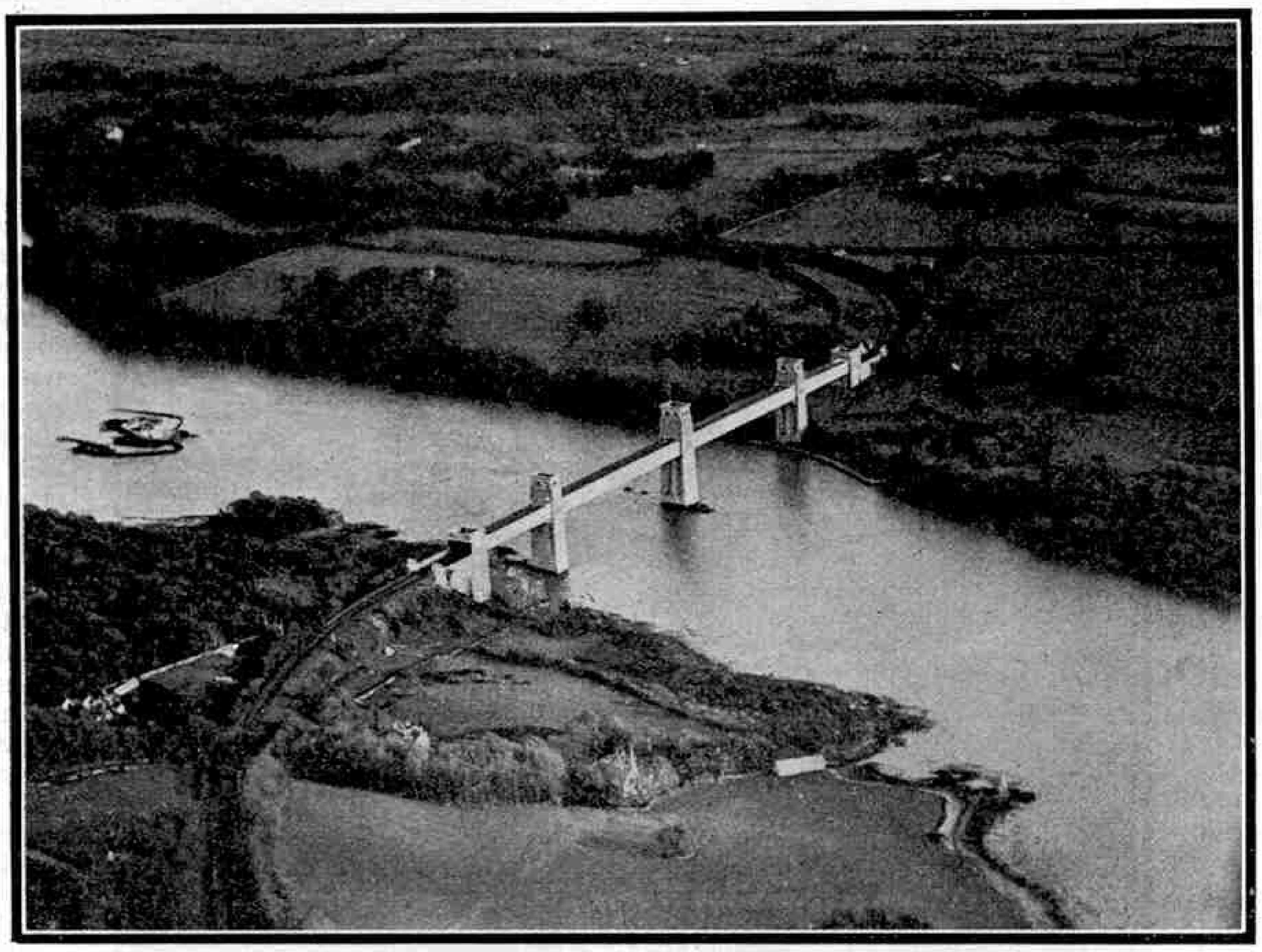
Floating Dock Towed 13,000 Miles

A new floating dock with a lifting power of 17,000 tons is now on its way to Wellington, New Zealand. It was constructed at the Tyne yards of Swan, Hunter & Wigham Richardson Ltd. at a cost of £196,125, and is being towed on its voyage of 13,000 miles by two powerful tugs. It is due to leave Aden about the 15th of next month, for the weather in the Indian Ocean should then be most favourable. The cost of insuring the floating dock for its lengthy ocean voyage is £30,000.

The overall length of the dock over the pontoons is 527 ft. and the platforms are 584 ft. in length. The overall width is 117 ft. 6 in. The draught of water over the keel blocks is 26 ft. and the dock can only be used in places where the depth of water is at least 46 ft.

New Railway Bridge in Punjab

A bridge over the Jhelum river at Khushab, in the Punjab, India, has been formally opened for traffic. It has been erected by the North-Western State Railway and is about 795 yds. or nearly half a mile in length. It has 15 spans, each of which is 159 ft. in length, and is supported on piers that are sunk to a depth of between 85 ft. and 103 ft. below the bed of the river. The bridge accommodates a railway track of standard gauge and also two roadways for vehicular traffic. A one-way traffic system is in operation, each of the roadways being used for traffic in one of the two opposite directions across the bridge.



An aerial view of the Britannia Tubular Bridge built over the Menai Straits in 1845-50 by Robert Stephenson. The total length of the bridge is 1,841 ft. 5 in. and the weight of one central tube is about 1,600 tons.

Fastest Vessel on North Sea Services

The motor ship "*Venus*," now in service on the route between Newcastle and Bergen, Norway, is the largest and fastest vessel at present operating in the North Sea. She is capable of completing the crossing in 19 hours, which is 8 hours less than the time occupied by her predecessors. The vessel makes two crossings weekly and is able to maintain a service for which two boats were previously necessary.

The propelling machinery of the "*Venus*" consists of two four-stroke, ten-cylinder trunk piston engines employing airless injection and superchargers, these being unusual features in a vessel of this type. Each engine develops 5,125 b.h.p. at 160 r.p.m. and during the vessel's trials, the total power output was 11,000 b.h.p. when running at 161.25 r.p.m.

The overall length of the new vessel is 412 ft. 9 in., her breadth 54 ft., and her moulded depth to the awning deck 32 ft. Her gross tonnage is 5,406, and she has accommodation for 261 passengers and a crew of 72 in addition to extensive cargo space. Her service speed is 19½ knots, but during the trials a log speed of 20.64 knots was recorded.

The vessel is fitted with two breakwaters and the bow has been specially designed to keep the decks clear of water even when very strong head seas are encountered.

World's Largest Water Turbines

A large power house that is rapidly approaching completion at Ryburg-Schworstadt on the Rhine is to be fitted with four Kaplan water turbines that will be the largest of their kind in the world. One of them is already in operation to meet local requirements. Each turbine will be capable of making use of water flowing at the rate of from 2,350 gallons to 66,000 gallons per second, and will develop about 40,000 h.p. The weight of each flywheel, together with its axle, is about 280 tons.

Canadian Ice Breaker and Train Ferry

A vessel that is an unusual combination of passenger ship, ice breaker and train and car ferry was recently launched at Lauzon, Quebec. She has been constructed for the Canadian National Railways, by whom she will be used for service between New Brunswick and Prince Edward Island, and is the largest ship of this type ever built in a Canadian shipyard.

The vessel is called the "*Charlottetown*." She is 324 ft. in length, 59 ft. in moulded breadth, and has a depth of 25 ft. Her gross tonnage is 4,800, and she has an estimated speed of from 14 to 15 knots. Three heavy steel propellers are fitted to the vessel, one of which is at the forward end and is designed for cutting ice. There is accommodation on board for 750, including passengers, officers and crew, while 16 railway coaches, and from 40 to 50 motor vehicles also may be carried. The cost of the vessel was about £445,000.

Aerial Cableway in Himalayas

The construction of an aerial cableway connecting Kalimpong and Reang is a notable Indian engineering achievement. Reang is the terminus of the railway line running from Darjeeling, in the foothills of the Himalayas. Kalimpong is a hill station about 3,300 ft. above Reang, and is on an important trade route. The two places are connected by a precipitous and dangerous road. This is only 12 miles in length, but it is so difficult that carts necessarily take from 18 hrs. to 24 hrs. to make the journey between the two points. On the aerial system now erected one place may be reached from the other in one and a half hours.

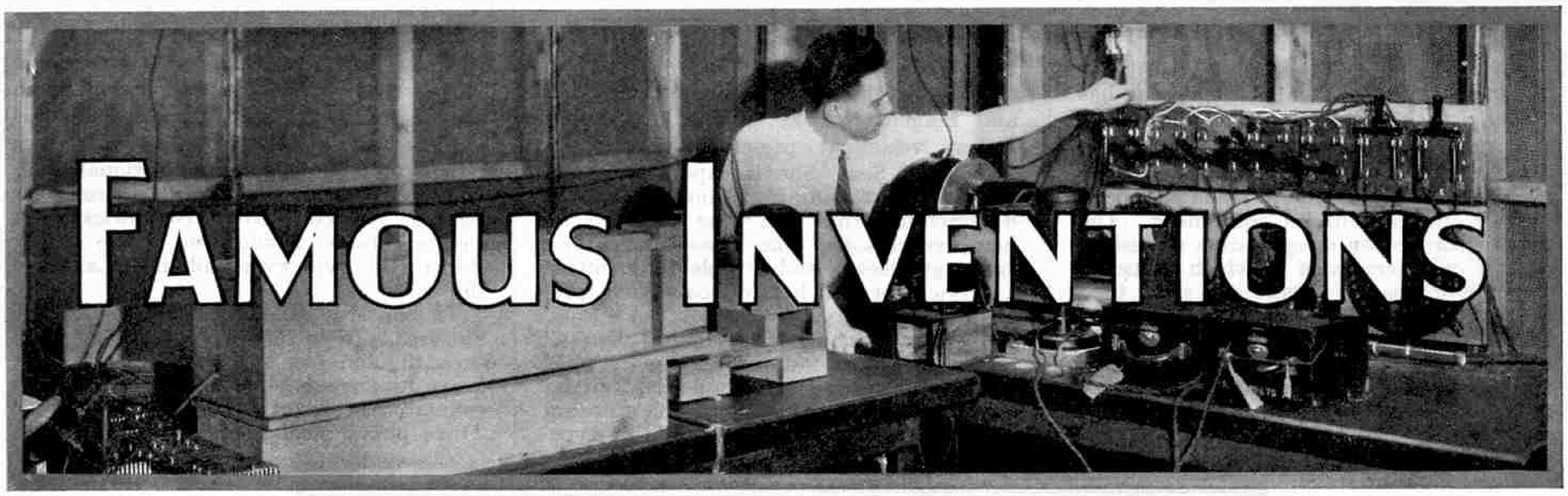
The cableway is in two sections and is seven and a half miles in length. The cars employed travel at intervals of three minutes and each is capable of carrying a load of 1,200 lb. The tallest supporting tower is 139 ft. in height. The work of construction occupied 18 months and the cost was about £12,500.

The new aerial cableway is not the first one to be constructed in the Himalayas, similar means of transport being comparatively common in these mountainous regions.

Steam Accumulator's Sea Voyage

An unusual transport problem arose recently when a large steam accumulator that had been constructed in Annan was found to be too bulky to be conveyed by rail or road to the works in Greenock where it was to be installed. It was therefore despatched by sea. The shell of the accumulator was made watertight, and it was towed behind a tug, the voyage being completed in 23½ hrs.

The accumulator weighs 65 tons. Its diameter is 14 ft. 9 in., while its length is 51 ft., and its capacity 7,870 c. ft.



FAMOUS INVENTIONS

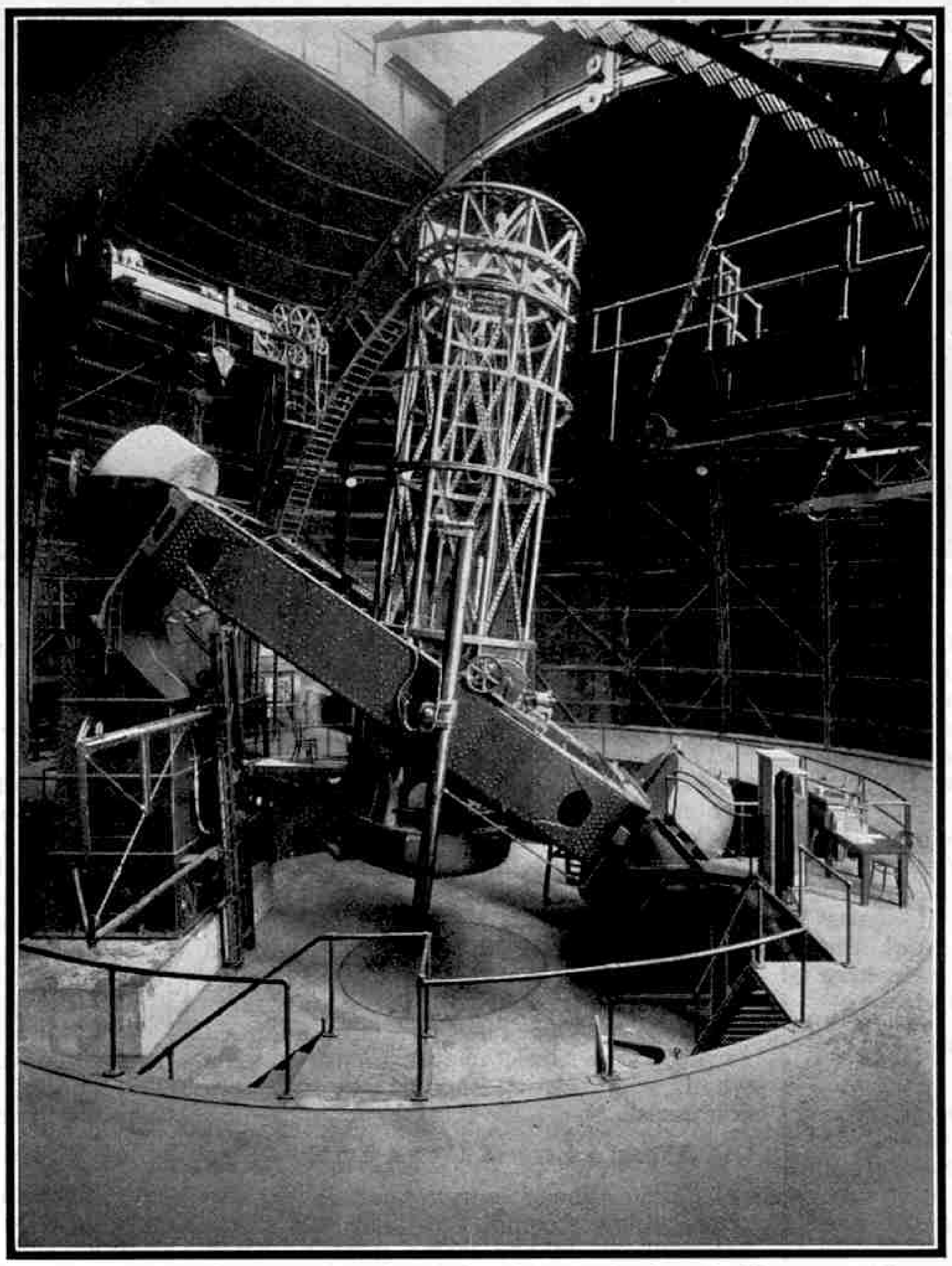
XXV.—GREAT TELESCOPES OF TO-DAY

IN the two previous articles in this series we have told the story of the invention of refracting and reflecting telescopes and have described their development from crude beginnings to instruments of high power and precision. In this article we propose to describe briefly some of the famous modern telescopes that have enabled astronomers to penetrate far into the depths of space and solve some of the baffling problems of the universe.

Refracting and reflecting telescopes of ever-increasing size and power have been constructed during the past 50 years. Each type has its particular advantages and disadvantages. Refracting telescopes probably will always be the chosen instrument for carrying out observations that require the utmost accuracy, but it does not seem likely that they will ever attain the wide apertures and light gathering powers of the largest reflecting telescopes.

A large modern telescope is far too heavy to be manipulated by hand and it is moved about on its support or mounting by an electric motor in the immediate control of the observer. The instrument is used in one of the dome-shaped structures that form such a characteristic feature of large observatories. The domed roof is not the fixed structure that it appears to be from the outside but is carried on groups of rollers or wheels that travel round a track inside and near to the top of the circular wall of the building. It is thus readily movable in either direction. One portion of the dome is mounted separately from the rest so that it can be slid to one side so as to provide a sector-shaped slit through which the telescope obtains direct access to the sky. The shutter, as this movable portion is called, and the dome itself are moved electrically.

Various methods are employed to bring the observer quickly and easily within reach of the eyepiece of a large telescope, no matter what position this may happen to occupy. One very general method is to instal electrical mechanism by means of which the floor of the observatory may be raised or lowered as required. Other means to the same end are wheeled step-ladders of adjustable height and narrow observation galleries running round the upper part of the room.



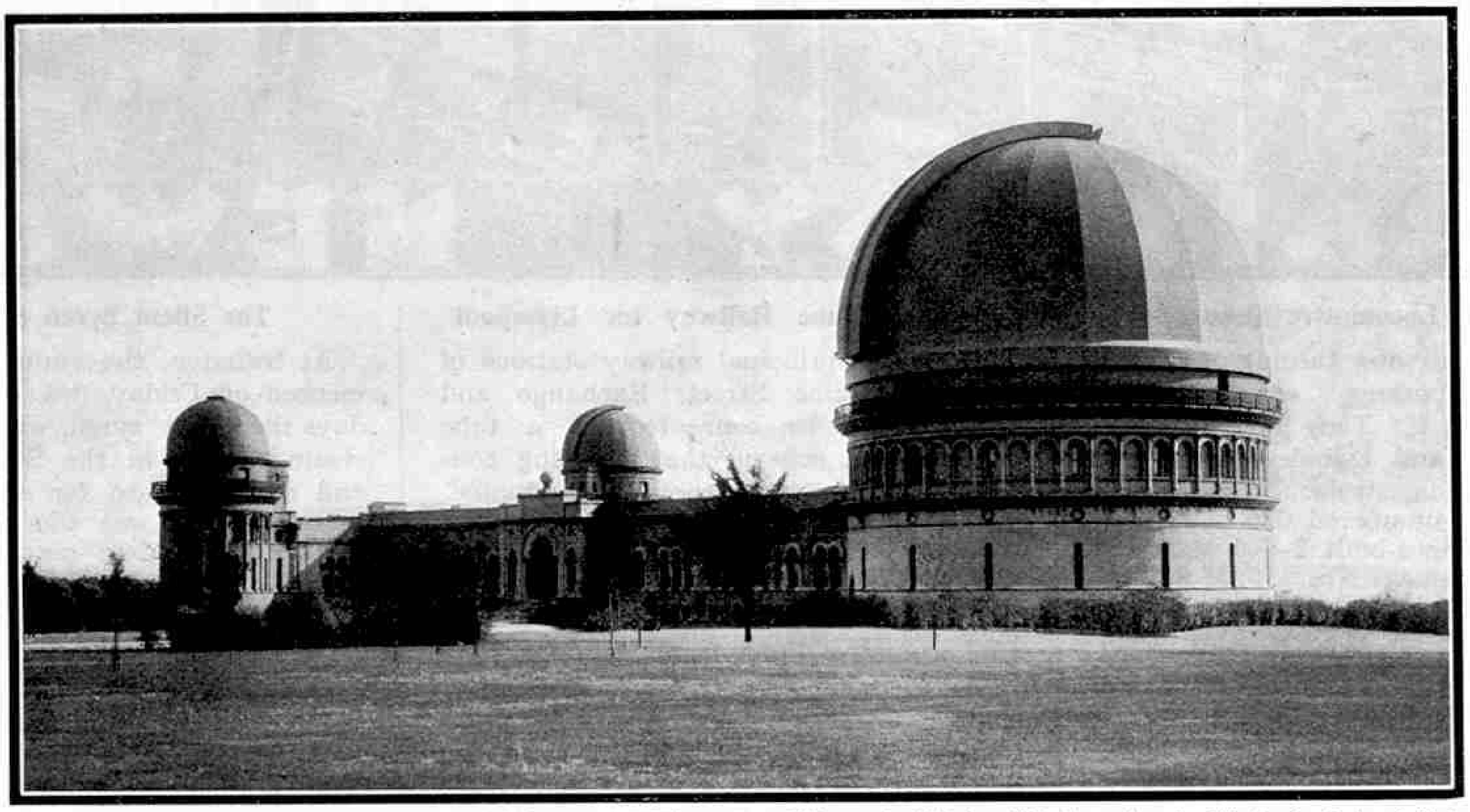
The largest telescope in the world ; the 100-in. reflector at the Carnegie Observatory, Mount Wilson, California.

If the observer were to set the telescope so that it pointed at a certain star, and afterwards made no further alterations, the star would gradually pass across the field of view and disappear from sight. This apparent travel is due to the rotation of the earth, and the astronomer compensates for it by moving the telescope constantly at the same rate as the earth's movement. Similarly, if he is to continue observations he must move with the instrument, and the simultaneous movement of the telescope and the observation floor is effected by clockwork mechanism.

In June 1847 an achromatic refracting telescope of 15 in. aperture was mounted at Harvard College, U.S.A., and this and a similar instrument at the Russian National Observatory at Pulkowa had the distinction of being the largest telescopes of the kind in the world. This record was exceeded in 1865 when an object-glass 18 in. in diameter was successfully ground and polished by Alvan Clark of Cambridgeport, to the order of the University of Mississippi. Clark was a portrait painter who had become interested in astronomy, and about 1850 had begun to grind small lenses in his spare time. Early successes led him on to more ambitious efforts, and he devoted more and more time to his hobby. His skill became widely known and eventually he became the head of one of the most famous firms of opticians in the world.

In 1872 Clark constructed a 26 in. achromatic refracting telescope for Washington. It cost £4,000, and was the largest instrument of its kind in the world until a similar one of 27 in. aperture was completed in 1880 by Howard, later Sir Howard, Grubb for the Vienna Observatory. Shortly afterwards Clark regained the record with a telescope of 30 in. aperture that he constructed for the observatory at Pulkowa. His crowning achievement was the completion in 1886 of an achromatic object-glass 36 in. in diameter for the Lick Observatory in California.

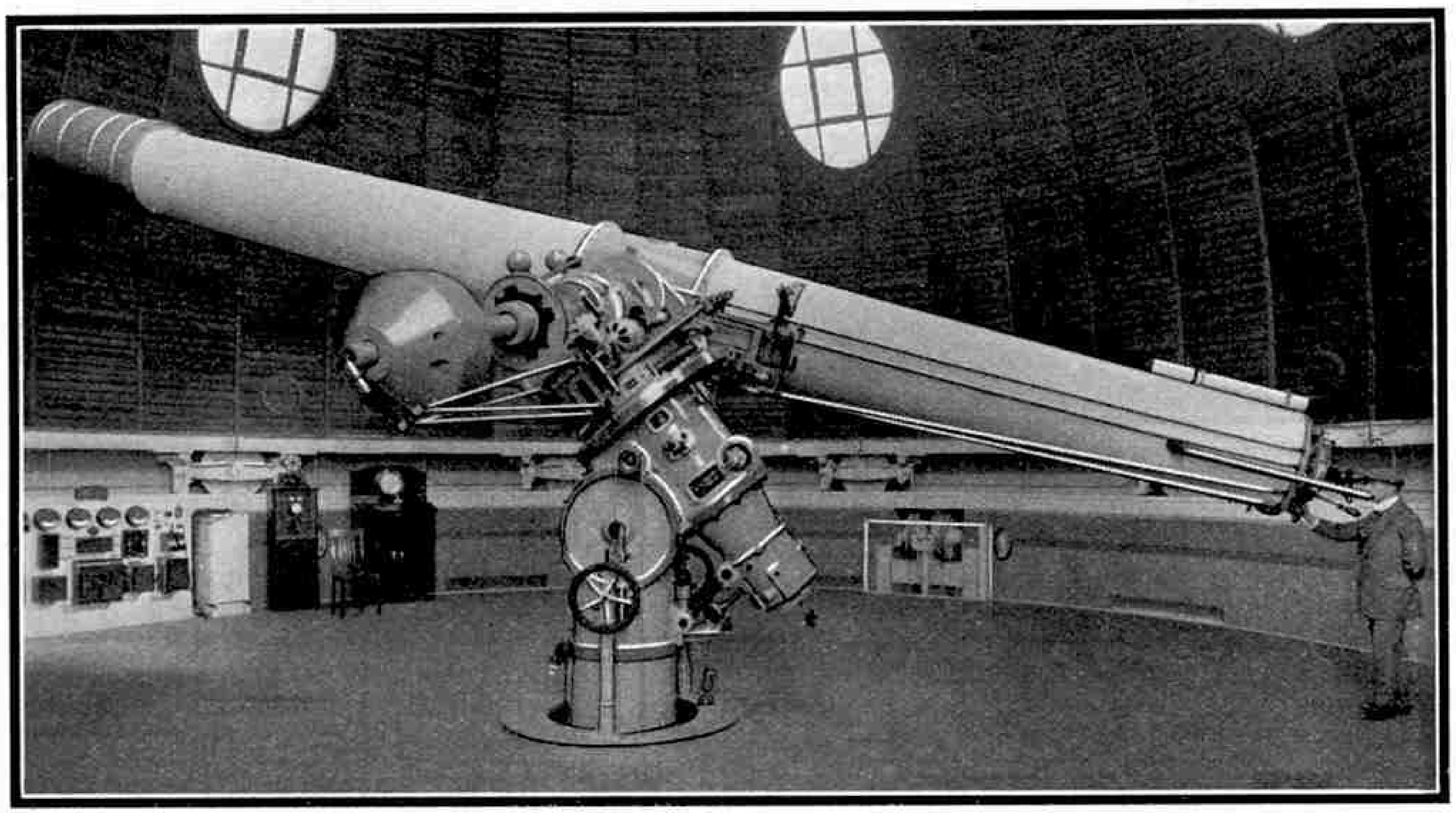
The Lick Observatory is named after a San Francisco millionaire, and an interesting story is told of its origin. Lick had proposed to leave at his death sufficient funds to cover the cost of erecting two huge statues on the Pacific Coast of America in memory of himself and his wife. According to the story, a deputation of astronomers pointed out to him that in the event of war the statues might be destroyed by the enemy ; and they suggested that a large telescope erected on the summit of one of the Californian mountains would form a more permanent memorial. Lick adopted their suggestion and in 1874 he set aside £140,000 for the building and equipment of an observatory that was to contain a telescope more powerful than any constructed up to that time.



The Yerkes Observatory of the University of Chicago, at Williams Bay, Wisconsin, U.S.A. This is equipped with the largest existing refracting telescope, having a 40-in. objective.

Various sites for this observatory were tested and examined and finally Lick proposed that the observatory should be erected on the top of Mount Hamilton 4,209 ft. above sea level, provided that the authorities would construct a first-class road to the summit. The officials concerned were quick to appreciate the importance of the matter, and the construction of the desired road was put in hand and completed by December 1876. Unfortunately Lick had died three months earlier, and legal complications delayed the commencement of the erection of the observatory until 1879. The observatory was finally completed and equipped by 1888 at a total cost of £122,000, and the remainder of the sum granted by Lick was formed into an endowment fund.

The discs for the 36-in. object-glass were cast in France. The casting of the disc of crown glass to form the outer lens of the object-glass proved difficult and took two years, success not being achieved until the twentieth attempt. The disc of flint glass for the inner lens was cast without difficulty. It measured 38 in. in diameter and weighed slightly more than 3¼ cwt. The domed room in which the telescope is installed is provided with a movable floor 60 ft. in diameter, so that the observer can get within convenient reach of the eyepiece of the instrument. This floor, which was the first of its kind to be constructed, can be raised or lowered through a distance of 16½ ft. by hydraulic power, the water supply for this being obtained from a reservoir less than a mile away.



Courtesy] [*Carl Zeiss, Jena*

650 mm. Refracting Telescope at the Berlin-Babelsberg Observatory, Germany. The instrument is shown adjusted for observations near to the horizon, the movable floor being raised to its highest position.

A few years after the completion of the Lick telescope a still larger refractor was installed in the Yerkes Observatory, U.S.A. This instrument has an object-glass 40 in. in diameter, and it is still the largest refracting telescope in the world. Its construction was made possible through the generosity of Mr. Yerkes, a wealthy citizen of Chicago. Two glass discs 42 in. in diameter had been cast in France to the order of the University of Southern California, which had begun the erection on Wilson's Peak of an observatory that was to include a huge refracting telescope. This project fell through, and the University of Chicago then bought the great discs and utilised them for the Yerkes telescope. The task of grinding them to the required size and curvature, and polishing and testing them, took five years to complete. When finished the discs were combined and formed an object-glass 3 in. in thickness and about 500 lb. in weight. The tube of this telescope is 63 ft. in length.

Turning now to large reflecting telescopes, we find that the United States possesses most of the outstanding instruments of this type, including the largest in the world. It is interesting to note, however, that what was probably the first reflecting telescope in America was a British instrument. This telescope had an aperture of 36¼ in. and was owned by Edward Crossley, of Halifax, England, who presented it to the Lick Observatory in 1895. The cost of erecting a building to receive the telescope, and the expense of conveying the instrument and its iron dome from England, were met by subscriptions from prominent citizens in California.

A 60-in. reflecting telescope was installed in the Carnegie Observatory, Mount Wilson, in 1907, and at that time it was the largest instrument of the kind in the world. The disc for the mirror of this telescope was cast in France and shipped to America, where it was tested at the observatory and was found to be satisfactory. The delicate job of grinding it to the correct curvature had not long been in progress when the glass suddenly flew into innumerable fragments, and the work was held up until another disc was obtained from the French makers. This disc was successfully ground and polished, and in its finished state was 8 in. in thickness and one ton in weight. Much valuable astronomical research has been carried out with this fine instrument. It is no longer the largest reflecting telescope in the world, however, for this distinction now belongs to the wonderful 100-in. telescope installed in the same observatory in 1919.

The making and erecting of this 100-in. telescope presented many problems, of which the greatest were the casting and polishing of the mirror. The difficult job of casting a glass disc of this size was entrusted to a French firm, and taxed their skill to the utmost. Disc after disc was cast, and each in turn cracked or developed serious flaws during the cooling process. Eight attempts were made before a disc was successfully cast,

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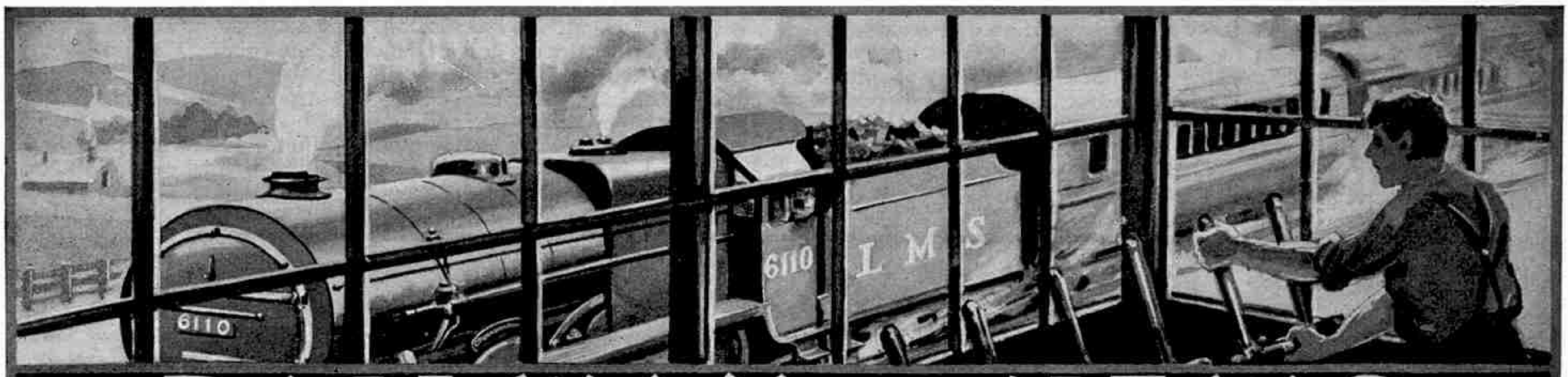


RAILWAY NEWS

L.M.S.R. Locomotive News

Crewe Works are now turning out a new series of 4–4–0 passenger engines of the standard Class 2 P. They have 6 ft. 9 in. coupled wheels and cylinders of 19 in. diameter and 26 in. stroke. The first to be completed is numbered 636. Of the new batch of Crewe-built 2–6–0 standard mixed-traffic engines, Nos. 13225-30 are already at work.

Some 0–6–0 tank engines have been built at Horwich and are numbered 16750-4.

New "Sandringhams" on L.N.E.R.

Two more 4–6–0 engines of the "Sandringham" or "B.17" class have been sent out from Darlington works. They are :—No. 2832, "*Belvoir Castle*," and No. 2833, "*Kimbolton Castle*." The remaining three engines of the present series will probably be at work by the time these notes appear.

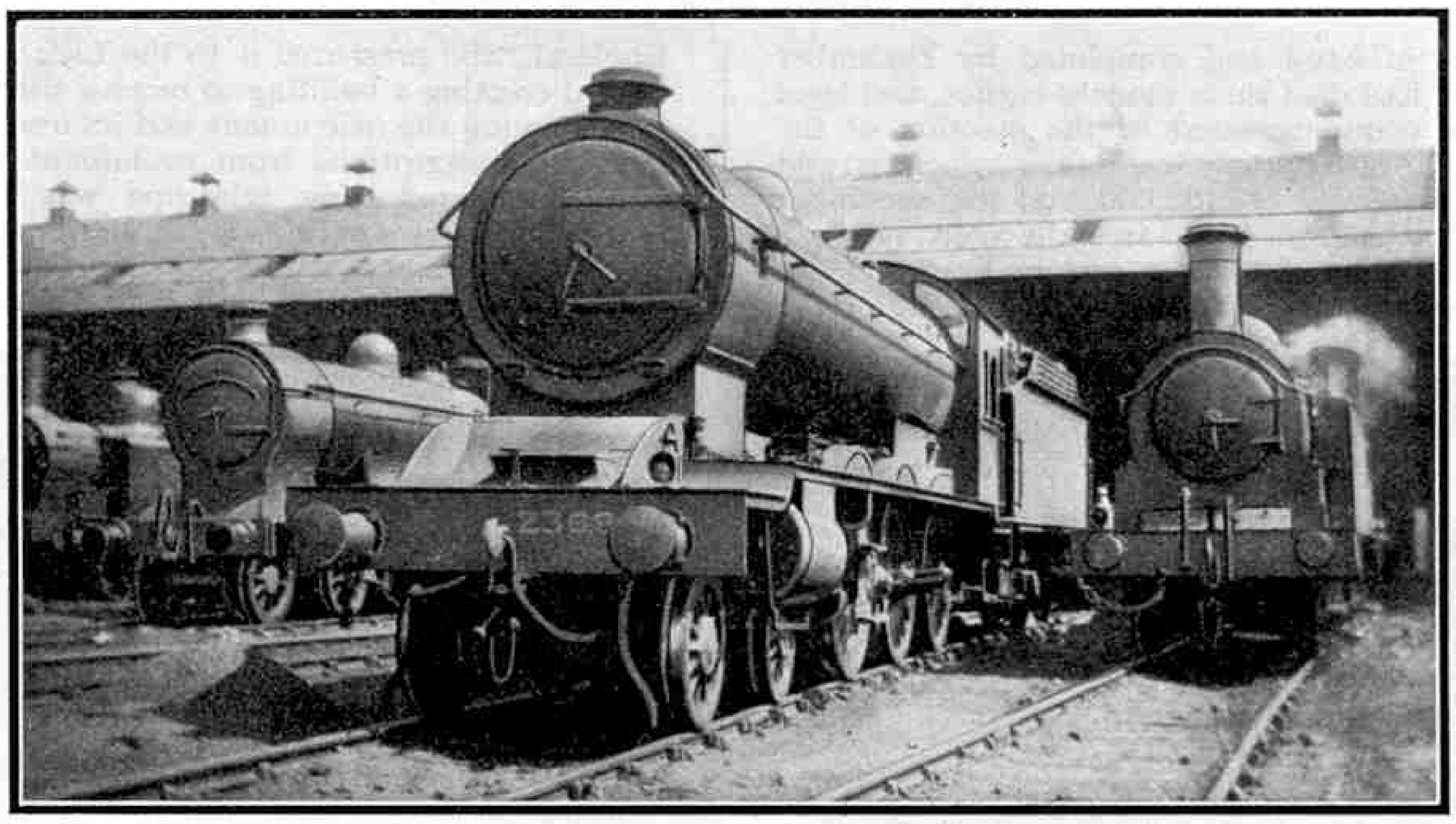
Messrs. Armstrong Whitworth & Co. Ltd. have now nearly completed the order for twenty 2–6–0 engines of the "K.3" class. Among the latest delivered are Nos. 1121, 1125, 1133, 1135, 1137, 1141. 1154 and 1156.

Sixteen of the Doncaster-built 2–6–2 tank engines—numbered 2900 to 2915—are now in traffic.

In addition to those mentioned in last month's "*M.M.*", three more of the "B.12" class, G.E.R. type of 4–6–0 express engines—Nos. 8500, 8501 and 8504—have been sent to the Great North of Scotland section, making five in all. They are working the express passenger trains between Aberdeen and Elgin. As they are about 25 per cent more powerful than the engines formerly available for these trains, they are proving very useful in dealing with the heavy tourist traffic during the summer months.

High-Speed Escalators at Highgate

A sum of £90,000 is being spent in bringing the "Underground" station at Highgate thoroughly up-to-date. The old lifts have been replaced by escalators of a new high-speed type which are capable of running at a speed of 180 ft. per minute. The speed at which they are at present being operated is 100 ft. per min., but this is to be increased later to 125 ft. per min.



The Haymarket engine shed, Edinburgh. The locomotive in the foreground is a L.N.E.R. 4–6–0, No. 2369. For this photograph we are indebted to our reader Mr. C. M. Furst, Joppa.

Proposed Tube Railway for Liverpool

The three principal railway stations of Liverpool—Lime Street, Exchange and Central—will be connected by a tube railway if a scheme that is being considered by the city authorities is adopted. Such a railway would add greatly to the travelling facilities of the city and its construction would help to relieve the prevailing unemployment.

Locomotive Notes from Manchester

The electrification of the Manchester, South Junction and Altrincham line (jointly owned by the L.N.E.R. and the L.M.S.R.) has released many tank locomotives for other services. A L.M.S.R. standard 0–6–0 T is retained at Altrincham, however, where it is being used for marshalling electric stock. The L.N.E.R. 2–4–2 (Great Central) tanks have been transferred to Manchester suburban services, while with the exception noted, the L.M.S.R. locomotives employed—standard 2–6–2's and North Stafford 0–6–2's—appear to have forsaken the district.

G.W.R. locomotives working into Manchester (Exchange) over joint lines via Warrington now include 4–6–0's of the "2900" and "4900" classes and new mixed traffic 0–6–0's. The Irish mail to Holyhead has several times been worked by 2990, "*Waverley*," occasionally with, as pilot, a L.M.S.R. "George the Fifth" returning to Chester.

Shunting duties at Deansgate Goods Depot (Cheshire Lines) are performed by small 0–6–0 tanks with stovepipe chimneys, from the Great Eastern section of the L.N.E.R. R.S.M.

The Silent Syren of Swindon

At Swindon, the annual holidays commenced on Friday, 3rd July, and for ten days the works' syren, which is the largest steam whistle in the South of England and can be heard for a distance of ten miles around, was silent. Thirty-two special trains were needed to carry the excursionists who left Swindon for various destinations.

The output of the works during July has, naturally, been low, but two of the new series of 2–6–2 tank engines have been finished. They are numbered 6110 and 6111.

Pulverised Fuel Tests on S.R.

Further 2–6–0 engines of the "U" class have been completed at Ashford works. These are numbered A.635 to A.640. The latest "U.1" class engines built at Eastleigh are Nos. A.900 and A.901.

Engine No. A.629 has been experimentally fitted to burn pulverised fuel and careful tests are being carried out.

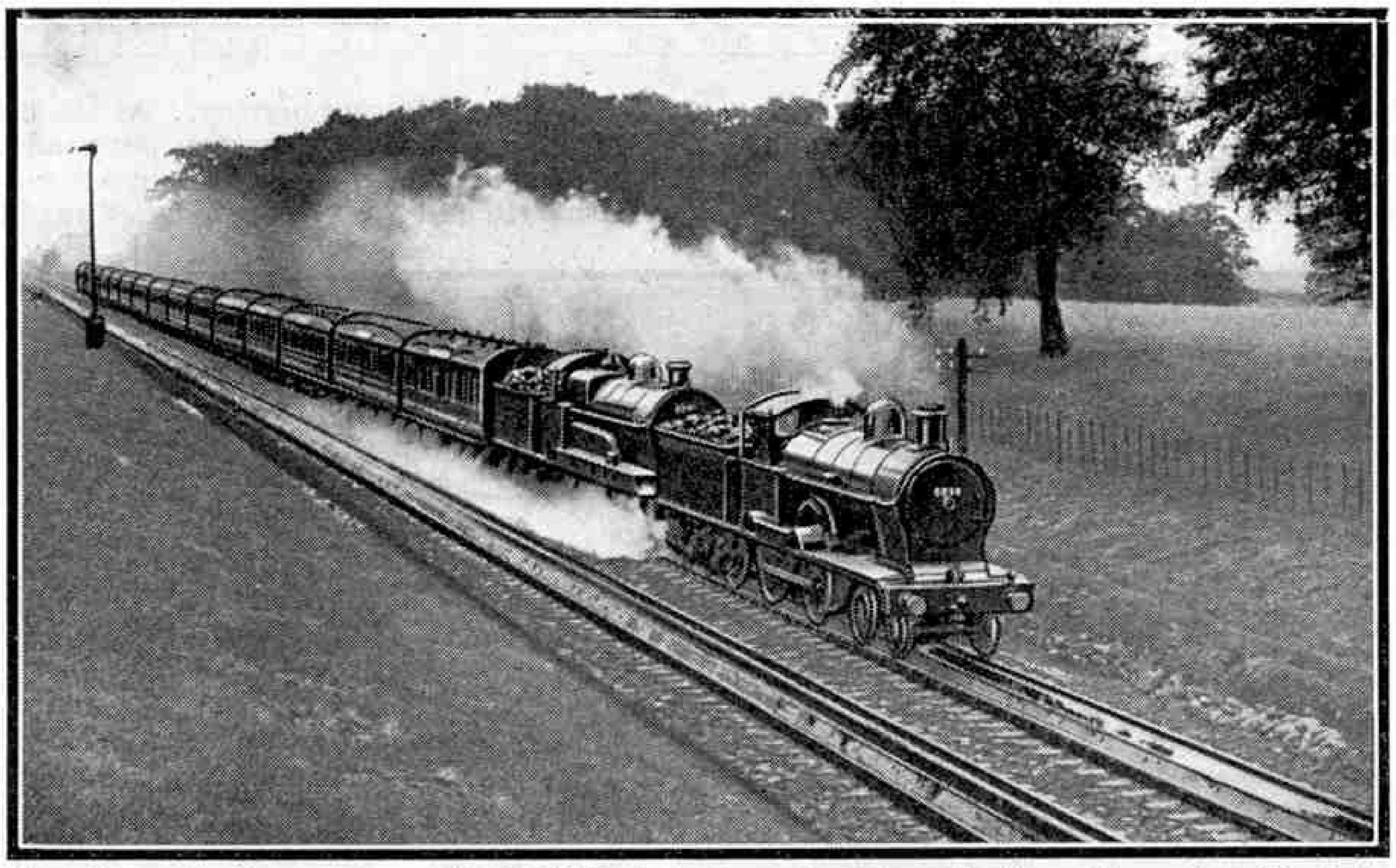
Engines of the "King Arthur" 4–6–0 class are now working through from London to Eastbourne. Some of the new 4–4–0 engines of the "Schools" class are now being used on the London and Hastings section, for which they were specially designed, for owing to the loading gauge and weight restrictions on this section the more powerful "Lord Nelsons" and "King Arthurs" cannot be used. The first of the class to go through to Hastings was No. 904, "*Lancing*," which on Monday, 6th July, worked the 10.25 a.m. train from Charing Cross. The splendid new station at Hastings was opened that day and a party of guests who were to attend the opening travelled on the train.

The whole of the permanent way between Tonbridge and Hastings has been reballasted and several difficult curves on the line have been modified in preparation for the introduction of these engines.

Ten additional engines of the "Schools" class are now under construction at the Company's works at Eastleigh. The locomotives of this class have become very popular and the coming of the new engines will be eagerly awaited.

The Fastest Train in the World

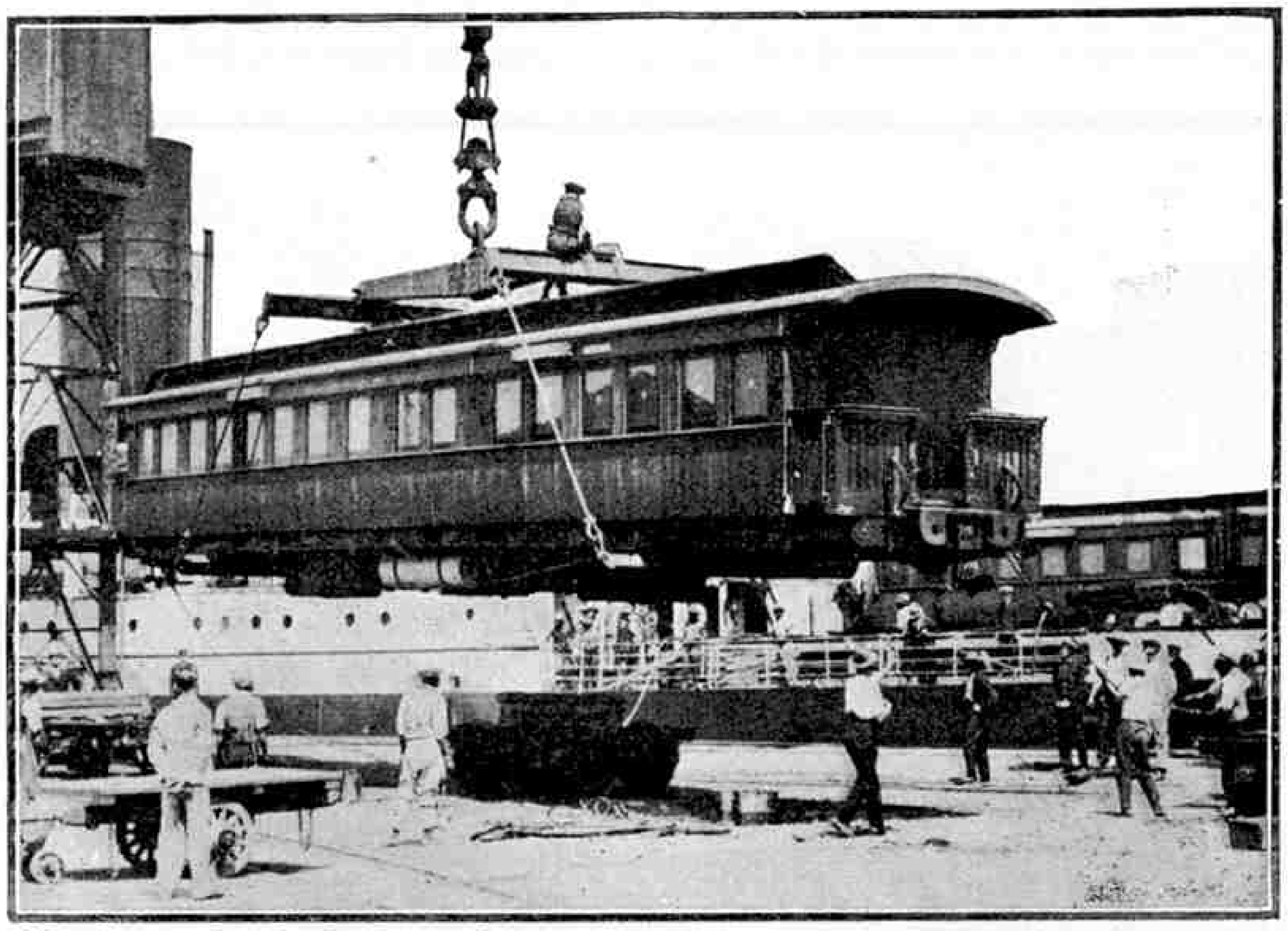
This summer has witnessed some truly remarkable accelerations in the railway services on the Continent of Europe and in America. The Canadian Pacific Railway can now claim to run the fastest train in the world. This Company has effectively answered the challenge made by the recent accelerations of the Canadian National Railways. The C.P.R. time between Montreal and Toronto has been reduced to 6¼ hr.—a cut of no less than 90 minutes. This involves some very sharp timings, the fastest run of all being on the section between Montreal and Smith's Falls. The "*Canadian*" is scheduled to cover the 128.7 miles between these places in two hours precisely, giving an average speed of 64.4 m.p.h. There are, however, two conditional stops at Westmount and Montreal West and when these are made the 124 miles from Montreal West to Smith's Falls must be run in 110 min., entailing an average speed from start to stop of 67.3 m.p.h. The "*Royal York*" in the opposite direction is likewise allowed two hours from Smith's Falls to Montreal but if the conditional stops are made a still tighter timing has to be observed since for the run from Smith's Falls to Montreal West only 108 min. are allowed, requiring an average speed of 68.9 m.p.h. This is enterprising running indeed.



The pilot engine of an express on the L.M.S.R. picking up water between Preston and Lancaster. The train is hauled by a 4–6–0 "Claughton," and piloted by a superheated 4–4–0 "Precursor."

On the Continent of Europe, and particularly in France and Italy, the railways are showing themselves very alert and progressive. Reference was made in the June "*M.M.*" to the speeding-up in Italy. The French Railways, however, are evidently determined to keep the lead in regard to express speed. The Northern Railway has still further quickened some of its already very fast trains. The fastest run is from Paris to St. Quentin, 95.1 miles in 88 min., which means an average speed of 64.8 m.p.h. from start to stop. On this and the other French lines there are numerous bookings at 60 m.p.h. and over.

It is much to be regretted that the British railways have announced no similar accelerations in their summer timetables for this year.



Unloading coaches for the South African Railways from the s.s. "Clan Mackinlay" on arrival at Durban. Our photograph is reproduced by courtesy of the "South African Railways Magazine."

Railway Fences

Great Britain is the only country where the railways are compelled by law to provide throughout their property fences for the protection of the public. Concrete posts and galvanised wire are now often used in place of the wood and iron employed formerly.

Smoke Deflector Plates on "Royal Scots"

In his report on the accident that befell the L.M.S.R. Scottish express at Leighton Buzzard on 22nd March, Lieut.-Col. A. H. R. Mount recommended that steps be taken to avoid the beating down of steam and smoke on to the cab windows, where they might obstruct the vision of the enginemen. He suggested that thorough tests should be made of the arrangement of "down-draught" plates on the side of the smokebox, which have been found efficacious for some years on the Southern Railway and on certain continental railways. The L.M.S.R. authorities acted promptly on this recommendation, and within a few days Engine No. 6140, "*Hector,*" was running with deflector sheets fitted on the sides of the smokebox.

The raised lip at the front of the chimneys of many types of locomotives was introduced for a similar purpose, while the chimneys of a large number of engines on the Highland Section of the L.M.S.R. have louvred openings in front to create the necessary upward draught.

Half-an-Hour at Waterloo

A correspondent recently spent an interesting half-an-hour at Waterloo—the Southern Railway terminus which is the biggest in Great Britain. He was in the station when the "*Atlantic Coast Express*" departed. This ran in two portions, both of which were heavy and well-filled with passengers. A "King Arthur" engine—No. E.781 "*Sir Aglovale*"—took out the first part and a "Lord Nelson"—No. E.865 "*Sir John Hawkins*"—followed with the second part. The cleaners at the shed had done their work well and both engines looked very spick and span. One of the new engines of the "U.1" class—No. A.891—went out on a Portsmouth train, and another of the series—No. A.898—was also seen in the station. The 11.30 express to Bournemouth was worked by No. E.524, one of the powerful 4–6–0 locomotives with 6 ft. driving wheels, and another of the same class—No. E.335—headed a heavy "Ocean Liner" special. A "King Arthur"—No. E.452 "*Sir Meliagrance*"—came in on a train from Exeter. The rear axle of the tender had evidently run hot, as flames were leaping from the right-hand axle-box.

A variety of engines of older types also seen included two 0–4–2 "Jubilees," Nos. E.634 and E.630; two of Drummond's 4–4–0 mixed-traffic engines, Nos. E.400 and E.413; and No. E.664, one of Adams's 4–4–0 locomotives with outside cylinders, a class that for many years ably dealt with the chief expresses of the L. & S.W.R.

Railway Track Changes in Ireland

In Ireland a considerable amount of railway track has been converted from double to single line. On the Great Southern Railway, 120 miles of track have been so treated, and 12¼ miles on the Great Northern Railway of Ireland are being similarly converted. By this change a large part of the expense of upkeep is saved, but by the use of improved methods of signalling the traffic capacity of the line is fully maintained. It is possible that further changes of a similar character may eventually be effected.

Tilbury Line Improvements

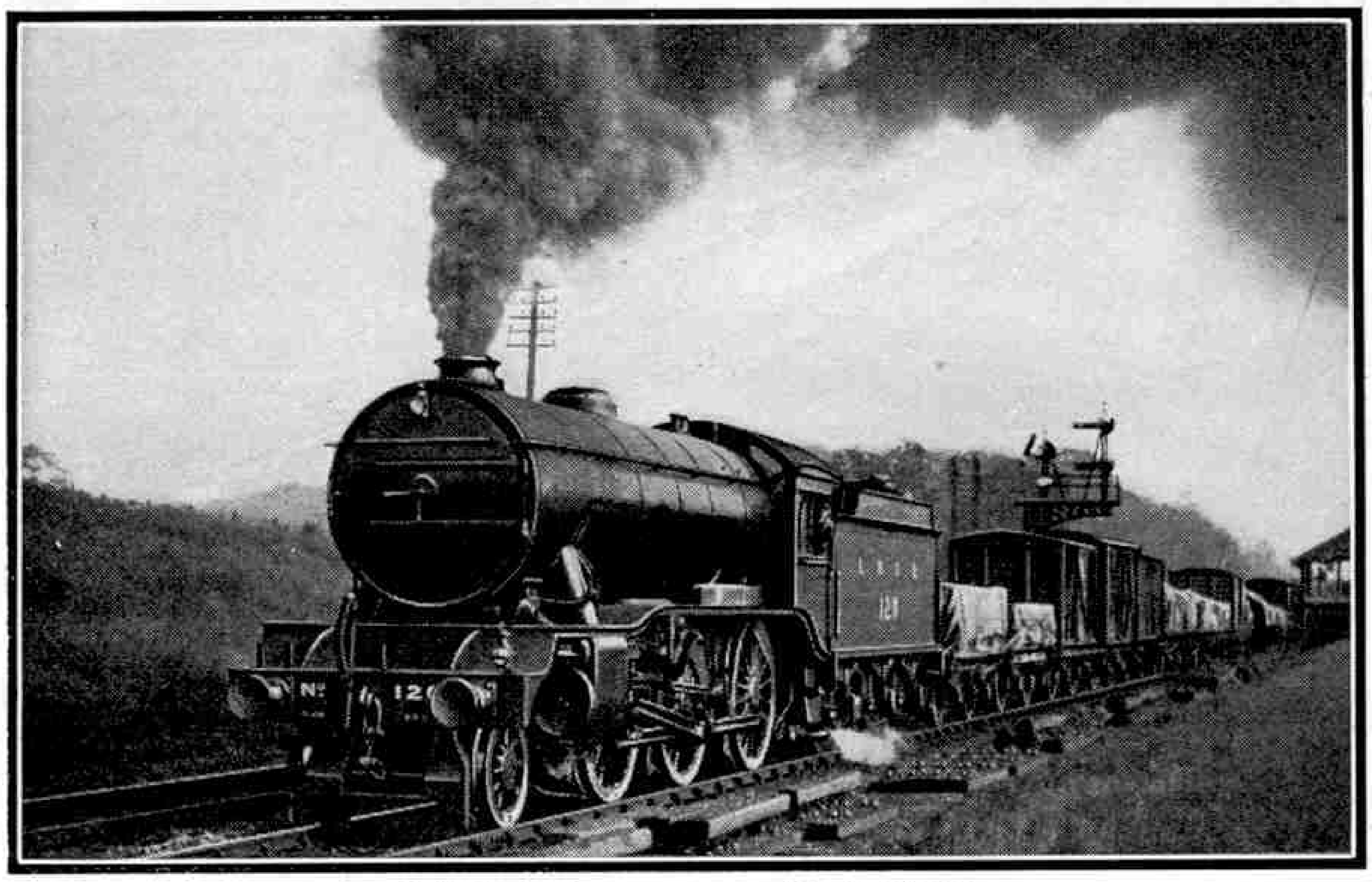
Work is being pushed forward on the £750,000 improvement scheme on the London, Tilbury & Southend Section on the L.M.S.R. In addition to the widening of the line, a number of sections are being prepared for electrification.

Seasonal Variations in Goods Traffic

How the Railways Organise their Resources

By R. D. Gauld, M.Eng., A.M.Inst.C.E.

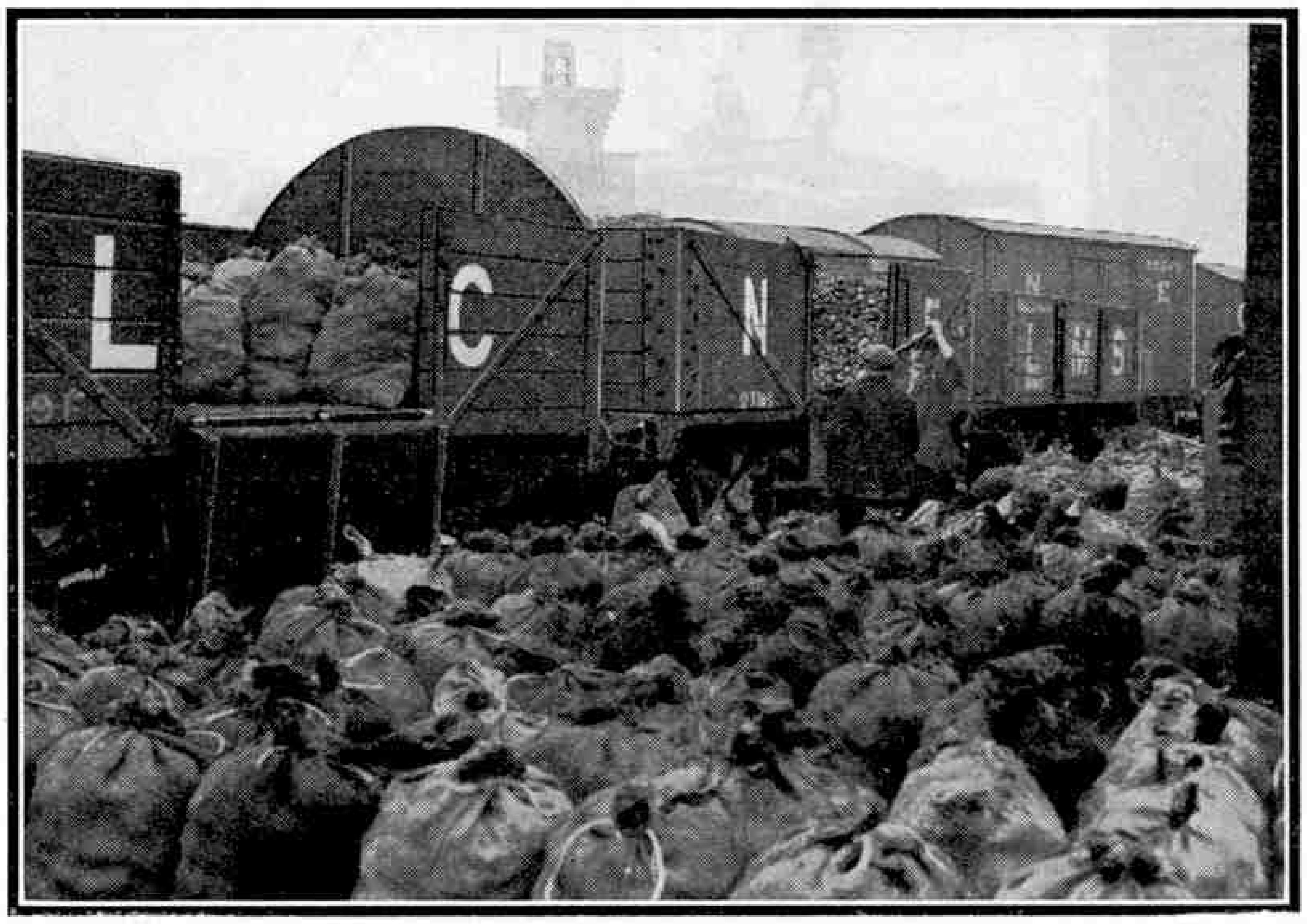
THE demand for railway transport is subject to three variations, which may be classified as daily, seasonal and periodic. The first two of these terms are self-explanatory, but the third is not quite so obvious. It refers to a fluctuation in demand that records show to take place at fairly regular intervals of years, possibly three or five or even more. In other words, it is found that an excessive demand is made, say, every fifth year or thereabouts, with slacker periods between. This variation is a very difficult one for the railways to meet, as it is clearly uneconomical to keep on hand sufficient wagons to deal comfortably with the traffic in the "excess" year. It would involve idle wagons during the slacker years, and hence capital lying idle for the greater part of this time.



A fast goods express on the L.N.E.R.

Daily variations can be dealt with fairly readily by a little forethought, and the worst that can happen is delay of a day or two in transit. Such delay is of course sometimes serious enough, but it is not generally disastrous to the railway companies. More wagon stock must be kept on hand than is absolutely necessary to deal with the slack days, but not necessarily amply sufficient for the greatest demands, which are dealt with by strenuous efforts to achieve better wagon use in loading and in running time.

It is the seasonal variations, however, that give the railway operator the greatest scope for scientific refinements in methods of working. To quote the words of an authority: "The problem to solve is how to meet the wide variations in demand for different classes of vehicle caused by seasonal requirements and fluctuations in trade, without incurring heavy capital expenditure to provide an excessive margin of stock which is only capable of being used during a limited portion of the year."



Photos courtesy] [*L.N.E.R.*

Potato traffic on the slip line at Sheffield.

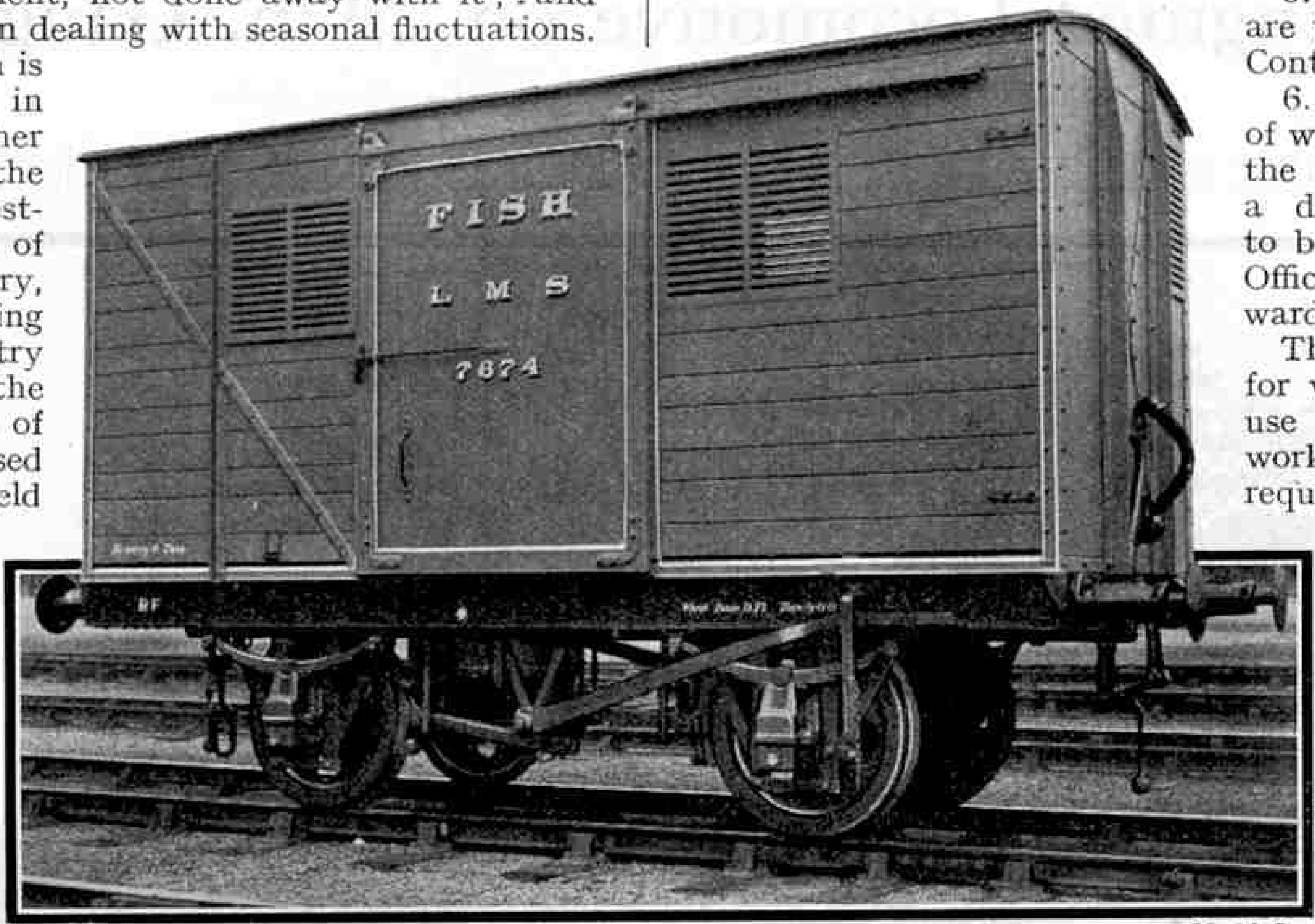
To take one interesting example, the haulage of fish from the various fishing ports to the markets of the great centres of population is an important part of the work of most of our railways. During Lent, for instance, there are heavy landings of fish at Hull, mainly due to heavy catches of Norwegian herring. Almost at the same time there are imports of a relatively high value at the Scottish ports due to the wintering herring. As the trade at Hull declines in the summer, that of the Scottish ports advances, and when these in turn begin to get slack, the north-eastern ports become busy. Yarmouth and Lowestoft are quiet until the autumn, and when the rush begins there the trade of the ports north of the Humber is declining. Grimsby is an important exception to this seasonal fluctuation because it meets a fairly constant demand and can draw from different fish supplies, its main function being to cater for the "fish-and-chip" trade.

The satisfactory solution for dealing with this particular commodity and its seasonal fluctuation illustrates well one of the advantages of the grouping of the British railway systems. As one group caters practically for the whole of the fishing industry on the east coast, it is a relatively simple matter to transfer the fish wagons to the area of maximum demand so that they get good loadings for the greater part of the year. A similar argument applies to the west coast fishing ports, although the volume of trade there is not so great.

Another important industry showing big seasonal fluctuations is the livestock trade. Generally speaking there is a huge increase after June in the livestock trade in Scotland, with a smaller advance in the area lying between the Humber and the Tweed, and a falling off in that part of the country south of the Humber. Here again the pooling of the wagon resources overcomes the difficulty.

It may be mentioned here that prior to the coming into force of the Railways Act of 1921 the companies had fully realised the wastage occurring through each individual company attempting to meet seasonal fluctuations from its own wagon resources. Large borrowings of wagons took place by agreement, but the arrangements were somewhat cumbersome and it might happen that a company that had lent wagons for a definite period had a sudden call that they could only meet with difficulty. Hence the evolution of the "common user" arrangement, by which each company labelled a certain number of its wagons "common user" or "for common use." These wagons could then be utilised for previously agreed traffics by any of the companies on to whose lines they might happen to come. A periodical stock-taking was necessary, and repairs were carried out by each company to its own wagons, either in shops on its own system, or at depots staffed by its own men at big junctions where large quantities of wagons were handled. Grouping has merely modified the arrangement, not done away with it; and it is still a most useful factor in dealing with seasonal fluctuations.

The sugar beet traffic, which is a comparatively new thing in this country, illustrates another method of dealing with the problem. The beets are harvested from about the end of October until early in January, and with the sugar extracting process worked in this country it is not possible to store the beets for any great length of time. The sooner they are used after raising, the better the yield of sugar. East Anglia is one of the chief areas concerned, and to deal with the heavy loadings from the farmers to the factories a system of loading permits was introduced by the L.N.E.R. in 1927. The farmers are able to estimate with fair accuracy, a week or two before the beets will be ready for raising, what wagons they will be able to fill for the particular factory that they have agreed to supply. A railway representative collects the information from the farmers, consults with the factory management as to the rate of supply, works out the train and truck arrangements, informs each farmer by means of a "loading permit" when he will be able to load, and sees that he has the necessary trucks at that time. The system has been very successful, and in the words of an L.N.E.R. officer: "The exercise of forethought avoids congestion, waste of wagons, delay to traffic and inconvenience to growers and factories."



Courtesy] [L.M.S.

The latest type of L.M.S. fish van.

The curious nature of the Lincolnshire potato traffic is worth a passing notice. The "new" season is in July and August; the "old" season is September to April. The traffic centres on Boston and Spalding, and a series of special trains that commence to run in July are required.

To get the best use from the wagon stock and therefore be in the best position for dealing with seasonal variations, it has been found necessary to have some system by which a practically complete and up-to-date account is kept of the location and state of all the wagons owned. Each group has its own system, but that in use on the L.N.E.R. is probably the most complete and may be briefly described.

There is a Central Control office at York, working down through the rolling stock sections in 24 District Superintendents' offices, to 120 wagon control depots. Information is received early each day at York of the exact position at all parts of the system, and by 6 p.m. all the adjustments of stock are authorised. The scheme is as follows.

Courtesy] [L.N.E.R.

Loading up a fish train at Grimsby.

1. Large notices are posted from time to time requesting traders to order their wagons not later than 12 noon on the day before they are required for loading.

2. A wagon report is to be made out at noon each day by every station to the Wagon Control Office, showing the inward loaded wagons on hand, empty wagons required for next day's loading, available and wanted, additional or spare.

3. A similar daily report is to be submitted not later than 2.30 p.m. from the Wagon Control Office to the District Superintendent.

4. A similar daily report from the District Superintendent is to be sent to the Central Control Office not later than 3.30 p.m.

5. The necessary instructions are to be issued from the Central Control Office not later than 6 p.m.

6. As a check on the number of wagons ordered by stations and the use made of those received, a daily return from stations is to be sent to the Central Control Office, showing the wagons forwarded, received and on hand.

The organisation provides amply for wagon demands and the best use of the stock. The actual working of the wagons to the required points is one of the functions of the Train Control Offices, with which the Wagon Control Office is in close contact. A very big item is the provision of the crews to work the extra trains of empties in the course of transfer, and heavy seasonal traffic. As a result of these control methods, however, a great deal of useless mileage has been eliminated, long delays in refuge sidings are minimised, trains can often be strengthened instead of being duplicated, and the personnel can be employed much more efficiently than in pre-control days.

A difficulty arises when dealing with goods traffic on account of the fact that so many different kinds of wagon are in use. A surplus of coal wagons, for instance, does nothing to meet the seasonal demand for fish trucks; and coal wagons are a particular trouble as they are mostly privately owned and must not be loaded except with the owners' traffic. It is not surprising to learn, therefore, that attempts have been made to produce general purpose wagons. Thus the L.N.E.R. have built some covered carriage trucks about 45 ft. in length, which can carry aeroplanes, motor cars, theatrical scenery, pigeons in baskets, fish, live animals from rabbits to elephants, fruit, luggage and other things. The wagons are ventilated, and have end doors, side doors, drop half doors and movable cross bars. Altogether they are extremely useful general utility wagons.

The same company own some **40-ton bogie** wagons capable of being employed in a variety of ways. When steel rails are being used in large quantities the vehicles are used as bolster wagons for carrying rails. If shipbuilding is brisk the bolsters can be removed so that the wagons become suitable for carrying long steel plates. If not required for either rails or plates the wagons can be used as ordinary low-sided goods wagons and adapted to many different purposes.

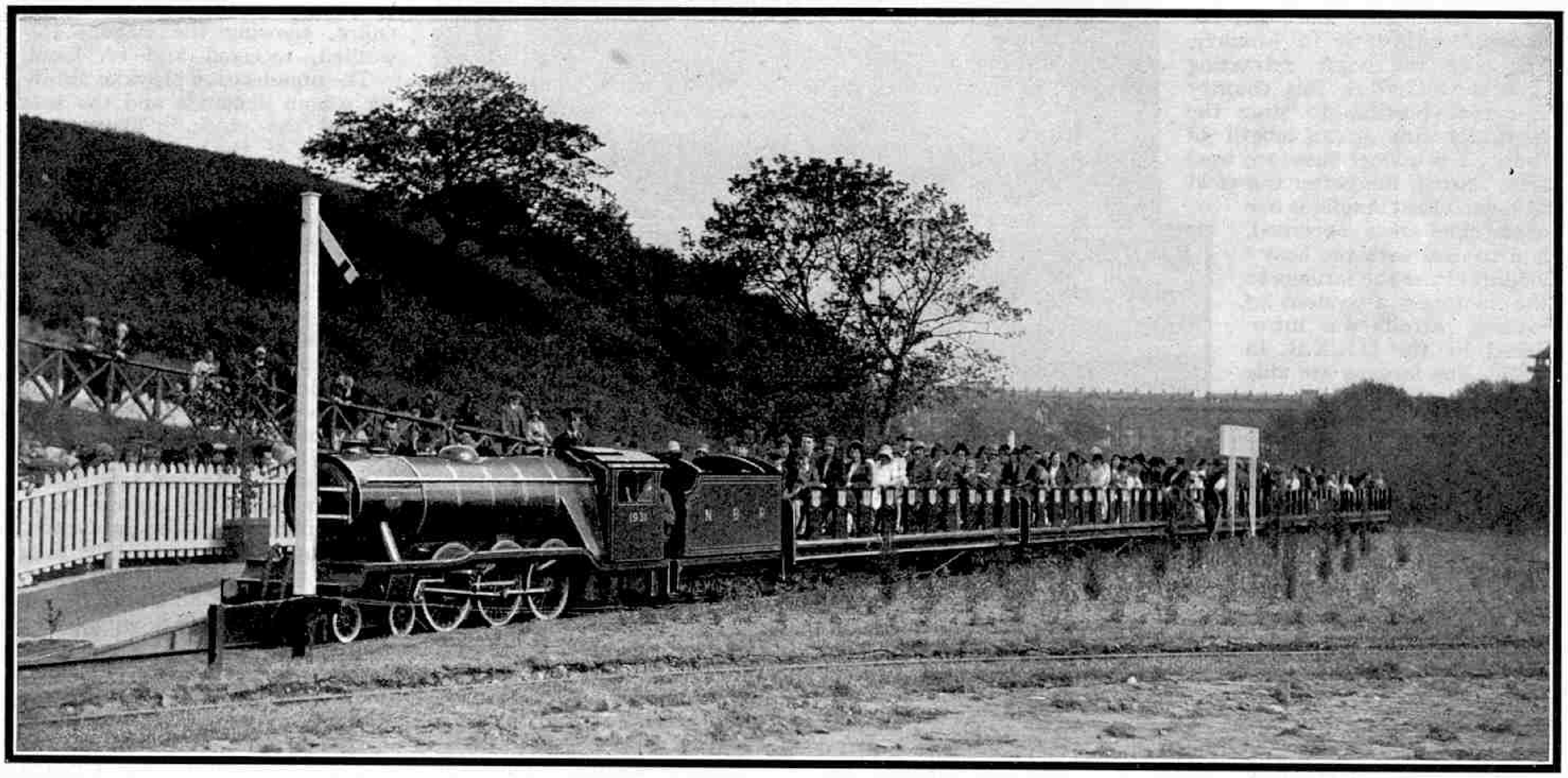
In conclusion we may glance at the methods adopted for dealing with seasonal fluctuations in the United States, a country always fruitful in operating ideas, though these are not necessarily applicable in their entirety to this country. The statement that in the 1925 season 20,000 car loads of grapes were sent from California to New York without delay, in addition to heavy consignments to other centres, gives an idea of the results achieved. At the Coal Commission in the same year it was reported that in normal times the miners could produce 40 per cent.

(*Continued on page 662*)

A Miniature Railway at Scarborough

Diesel-Engined Locomotive on 20-in. Gauge Track

By Rev. J. H. Martin



The train ready to leave Peasholm terminus on the North Bay Railway, Scarborough. The locomotive is a model of an L.N.E.R. "Pacific," but instead of being steam driven, is fitted with a Diesel engine.

READERS who visit Scarborough this summer will find that the "Queen of Watering Places" has added to its many attractions a fascinating miniature railway. This is called the North Bay Railway. It has a track nearly one mile in length, running from Peasholm to Scalby Mills, on the shore of the bay north of the bold headland on which stands Scarborough Castle.

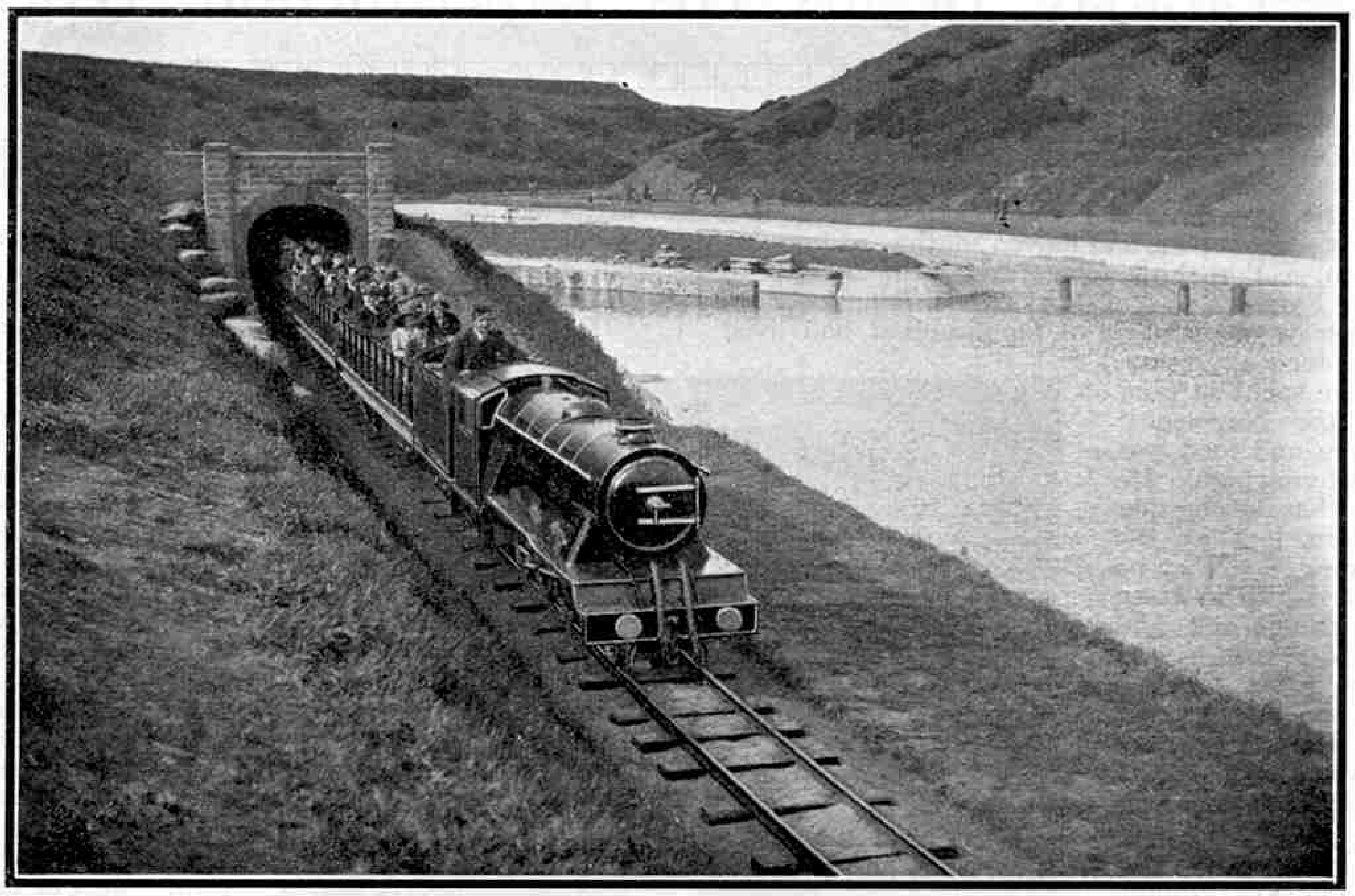
This new railway differs in various respects from other miniature railways throughout the country. The well-known Eskdale Railway in Cumberland, the Romney, Hythe and Dymchurch Railway in Kent, and practically all the miniature railways at pleasure resorts, are built to a gauge of 15 inches. This gauge, which is equivalent to one-quarter full size, has come to be regarded as standard for such lines, and many fine locomotives have been built to this scale. The Scarborough railway, however, is built to a gauge of 20 inches, which is approximately one-third full size. The track is laid in American fashion, the rails being flat-bottomed and bolted down to the sleepers. There are three stations, Peasholm, The Beach and Scalby Mills. Each of these is of the one-platform type that is so familiar on branch lines throughout the country. The track is single, and the semaphore signals, which are all of the "home" or "starting" type, are operated automatically by the engine itself.

Ingenious turning arrangements at the terminal station ensure that the engine is always in the facing position when hauling a train, and it never has occasion to run with the tender in front. On arrival at Peasholm from Scalby Mills the engine is detached and proceeds over a triangular layout while the passengers are alighting and others taking their place. At the other end of the railway the engine when detached proceeds through a tunnel 60 yards in length, and in doing so its direction is reversed. On emerging from the tunnel it joins the main line just beyond the platform, and backs on to the train ready for the return journey.

The line leaves Peasholm by a sharp curve and winds around the recently-constructed boating lake and swimming pool, passing under a water chute on the way. It continues through a cutting that follows the lines of approved railway practice, and passes into a tunnel from which it emerges alongside a plantation. The only real gradient on the line is faced as the train enters Beach Station. Beyond the platform of this station is the only level crossing on the line, and this is guarded by "Whistle" boards. The journey is continued from Beach Station along the cliff edge to the terminus at Scalby Mills. The views throughout the trip are very beautiful, and the novelty of travelling on a railway cut out of the cliff face provides just the right amount of thrill. On this part of the journey are seen to advantage the North Bay and the Castle.

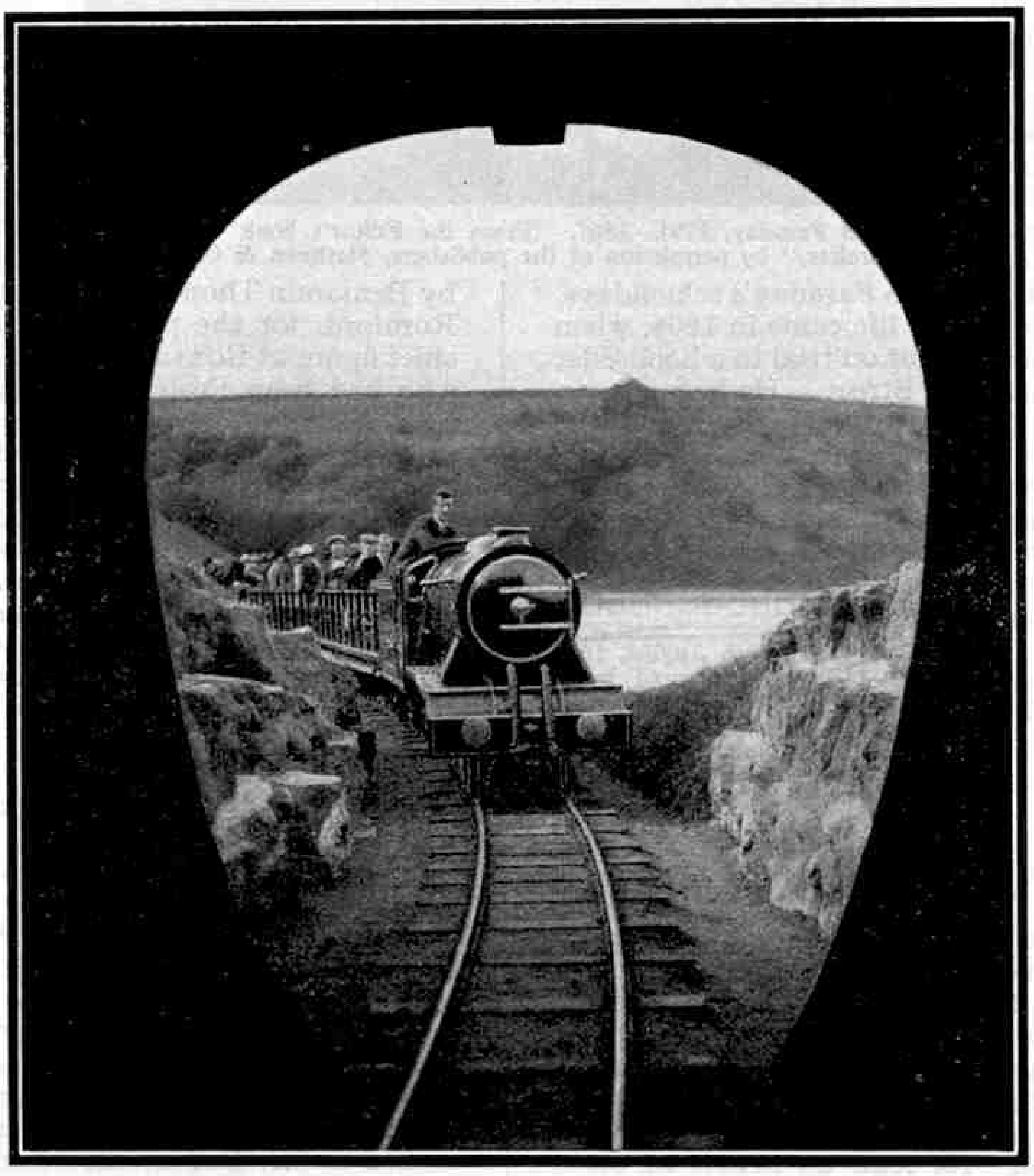
At present five coaches are in use on the railway. Their frames are true models of standard main line passenger stock, being mounted on two four-wheeled bogies. Each vehicle is of the open tramway type with reversible seats, and has accommodation for twenty passengers. The train is fitted throughout with the Westinghouse brake, and the maximum speed is 16 miles per hour.

To railway enthusiasts the most interesting feature of this line is the locomotive. The majority of miniature passenger-carrying lines have steam-driven locomotives, but the Scarborough railway provides a novelty in the shape of a locomotive equipped with a Diesel engine running on crude oil. The drive is through the Vickers - Coats hydraulic torque converter, which is capable of multiplying the torque of the engine three-and-a-half times, and varying it to suit the rate of travel. This arrangement eliminates all gears and the necessity for a friction clutch, and enables the engine to start and accelerate without the slightest jerk. In form and colour the locomotive is a splendid representation of a L.N.E.R. "Pacific," and is about one-third full size. Its weight in running order is 4½ tons, and it is capable of hauling a load of anything up to 40 tons.


Emerging from a tunnel alongside the picturesque lake.

The tickets at the station are supplied by automatic machines of the latest type. For threepence a ticket available for a single journey is issued, and sixpence secures a ticket passing two persons for a single journey, or one person for a return journey.

This interesting little railway is an all-Yorkshire production. The locomotive was built by Hudswell, Clarke & Co. Ltd., of Leeds, who also supplied the coach frames; the coach seating is by Slingsby and Armstrong of Scarborough, and the track was supplied and laid by Robert Hudson Ltd., of Leeds. The construction of the track bed, cuttings, tunnels and stations was carried out by direct labour under the supervision of Mr. H. W. Smith, A.M.I.C.E., the Scarborough Borough Engineer, and the first train to run on the line was driven by the Mayor of Scarborough.


The train passing through a cutting into the tunnel on the Scarborough miniature railway.

This Scarborough railway, and most other miniature railways, have been constructed purely for pleasure purposes. The Ravenglass and Eskdale Railway, and the Romney, Hythe and Dymchurch Railway, however, have to earn their own living in the same manner as full-sized railways.

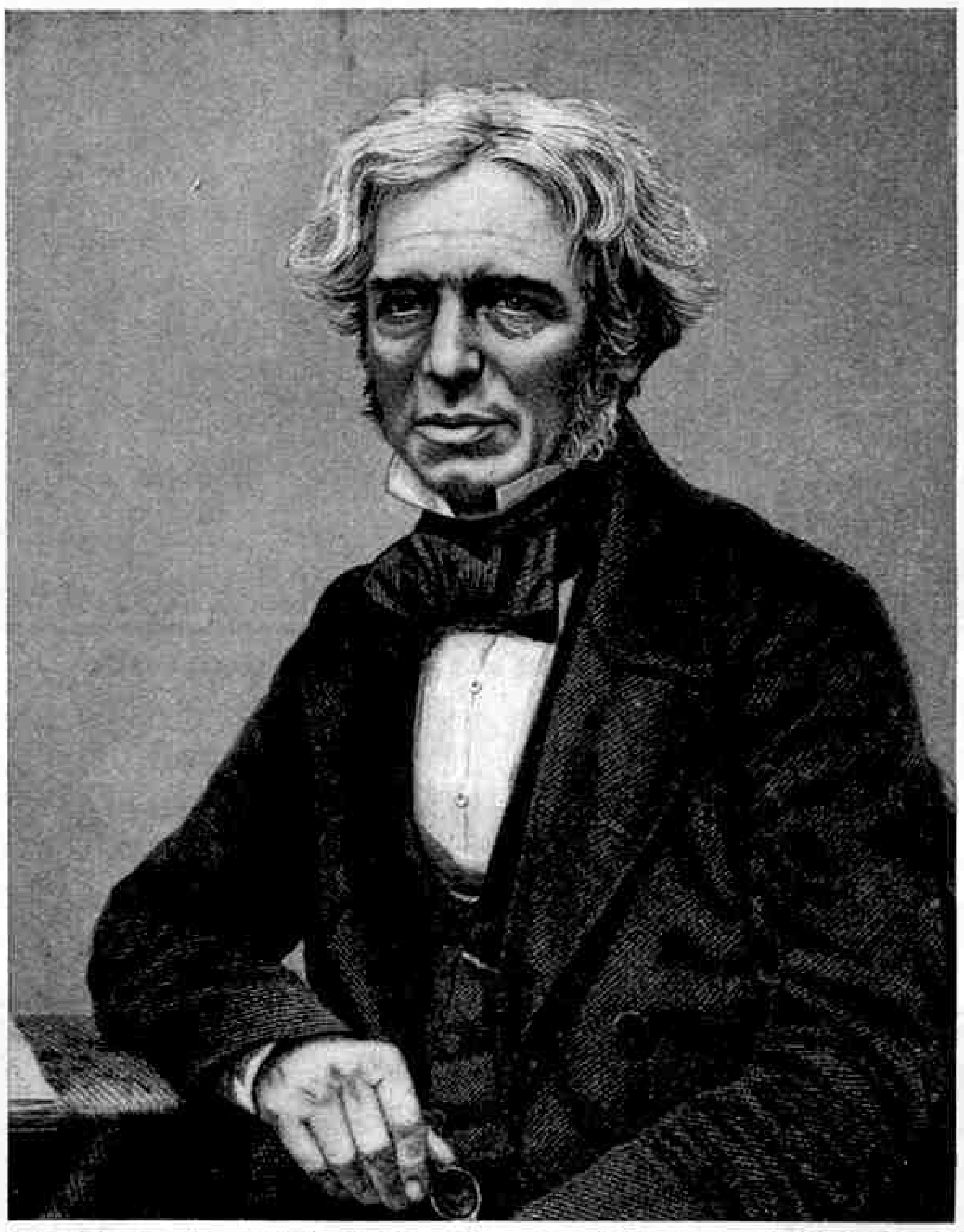
The Eskdale line was originally laid on a gauge of 2 ft. 9 in. with the object of handling iron ore traffic. After a while this traffic declined seriously, however, and the line was closed down. In 1916 it was rebuilt to a gauge of 15 in., and it now carries stone from a quarry to the crushing plant, in addition to passengers. The stone traffic is hauled by petrol-driven locomotives, one of which is of particular interest in having a Ford engine fitted with a housing with sloping ends, so that its appearance resembles that of an electric locomotive. Among the fine steam-driven passenger locomotives is the "*River Esk*," arranged on the "Poultney" articulated system, with a tender running on eight coupled wheels driven by two cylinders. Another locomotive, the "*River Mite*," is an articulated 4–6–0 : 0–6–4 converted from two "Pacific" type engines.

The Romney, Hythe and Dymchurch line, which was completed in 1927, connects New Romney on the Southern Railway with Hythe, and serves a popular holiday district. The locomotives in use are of several types, those of the "Pacific" wheel arrangement being based upon the well-known Gresley engines in a similar manner to the engine on the Scarborough railway.

The Centenary of the Dynamo

1.—Faraday Begins His Experimental Work

MICHAEL FARADAY was born on 22nd September 1791, in Newington Butts, which then was a Surrey village, but now is well within the boundaries of London. His father was a blacksmith who, a few years earlier, had moved southward from his native place Clapham, a Yorkshire village under the shadow of Ingleborough. Thus Faraday was of Yorkshire origin, for both his father and mother were members of families that had lived in the Yorkshire dales for many years.



Michael Faraday, 1791—1867. (From the Editor's book "Pioneer of Wireless," by permission of the publishers, Methuen & Co. Ltd.).

His early days were spent in poor circumstances, for the Napoleonic wars were then raging and food was scarce and the cost of living high. He himself has told us that his mother gave him a quartern loaf at the beginning of each week, and that he immediately divided it into fourteen portions, one for each morning and evening of the seven days it had to last. A few years after he was born, the family removed to the north side of the Thames, and in 1796 took rooms over a coach-house in Jacob's Well Mews, Charles Street, Manchester Square. There he played marbles with other boys in the roadway, which was his only playground.

Education was not easily obtainable in those days, and in any case Faraday's father had little money available to pay for it. The boy's schooldays therefore were both short and inadequate. He attended a small private school, and it is said that at that time he was too young to pronounce his "r's" properly. The mistress of the school determined to cure his lisp by the old-fashioned method of thrashing him, and sent his elder brother Robert to buy a cane. In great indignation Robert threw away the money for the cane, and went home. This brought his mother on the scene, and his career at that school was summarily ended.

Little else appears to be known in regard to Faraday's schooldays, and the next event of special interest in his life came in 1804, when he was 13 years of age. In that year he went on trial to a bookseller and stationer named Riebau, in Blandford Street. He began as an errand boy, and one of his chief duties was to carry round the newspapers to Riebau's customers. Newspapers and periodicals were dear at that time, and they were treated with great respect, each copy serving the needs of many people. It was customary to hire out many publications, and it was Faraday's duty to call for those that were finished with, in order to return them to the shop or to take them to other customers.

On 29th August, 1831, the principle of the dynamo was discovered by Michael Faraday, the famous British scientist; and this discovery has formed the basis of the electrical engineering industry of to-day. Faraday's career is in many respects unique, and in this and the succeeding article we shall describe how he rose from the humble position of bookseller's errand boy to become the world's greatest experimental scientist.

Apparently the year of trial was satisfactory, for on 7th October 1805, Faraday was formally apprenticed to Riebau, who undertook to teach him the business of stationer and bookseller, and also to instruct him in the art of bookbinding. The apprenticeship was to last seven years, and in consideration of the faithful service that the boy had already given, no premium was demanded.

In this manner Faraday was launched on what promised to be a useful career. Actually it proved to be only the means of entry into an entirely new sphere, in which he became one of the most brilliant figures. The youthful apprentice possessed powers of mind and thought that were quite unsuspected, and his thirst for information and knowledge of all kinds led him to look into the books among which he worked. He read an article on electricity in an encyclopædia that he was given to bind, and it fired his imagination. This led to his reading other scientific works, which revealed a new world to his eager mind. He was particularly attracted by books dealing with chemistry and with electrical science, and his interest in these subjects was so great that he bought out of his slender funds a few simple pieces of apparatus in order to carry out experiments for himself.

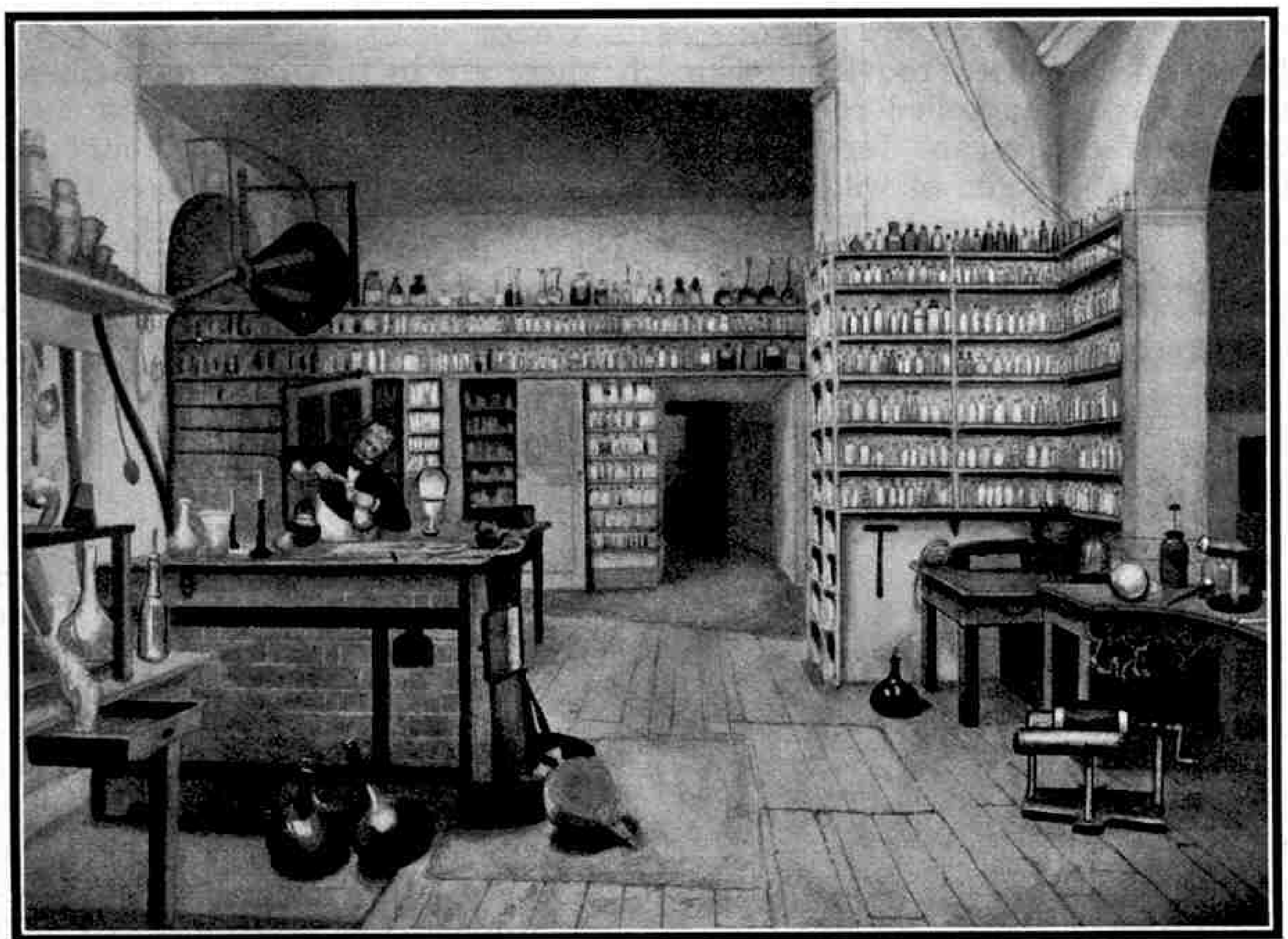
Fortunately Faraday met with encouragement from his master, who placed no obstacle in the way of his apprentice's efforts to improve himself, and even gave him permission to attend a series of lectures on science delivered by a Mr. Tatum. The price of admission to each lecture was one shilling, and the money required was furnished by Faraday's elder brother Robert, who had adopted his father's trade of blacksmith. This was a wonderful opening for the boy, for he heard a number of interesting lectures on his favourite topics, and saw many attractive experiments being carried out. In addition he made the acquaintance of several young men whose interests were similar to his own. Most of these youths were in a much better position than Faraday, but in spite of this they formed friendships with him that in several instances persisted throughout his lifetime.

Many of Riebau's customers took an interest in the intelligent apprentice, and gave him encouragement in various ways. One of them, a French artist compelled to live in exile, lent him books on perspective, and taught him how to draw. Another, a Mr. Dance, gave him tickets for four lectures by Sir Humphry Davy at the Royal Institution. His attendances at these lectures marks the turning point in his career. The Institution had been founded in 1799 by Benjamin Thompson, an American who afterward became Count Rumford, for the purpose of encouraging scientific research. Its chief figure at this time was Sir Humphry Davy, a Cornish scientist, who had been Professor of Chemistry since 1802. Davy was the most brilliant chemist of the age. He was also a wonderfully attractive lecturer, and as he moved in fashionable circles, his lectures ranked among the greatest events of the social season.

In his eagerness to miss nothing, Faraday always arrived early in order to secure a good seat, and made very careful notes throughout each lecture. These he rewrote in full when he reached home, adding drawings to illustrate the apparatus employed in the experiments he had seen. For some time he had felt a longing to get out of trade, which he then felt to be "vicious and selfish," and to take up scientific work of some kind, for he thought that "science makes its pursuers amiable and liberal." He now decided that the time had come to take steps towards the fulfilment of this ambition. His first attempt was unfortunate, for in his inexperience he wrote to no less a person than Sir Joseph Banks, a wealthy man interested in botany, who had become President of the Royal Society. When he called at Sir Joseph's house in order to learn the result of his appeal he was informed by the porter that there was no reply, which is not surprising.

This rebuff did not deter Faraday at all. He had spoken of his wishes to Mr. Dance, the customer of Riebau who had given him the lecture tickets. Mr. Dance was a member of the Royal

Institution, and he encouraged the youth to write to Sir Humphry Davy. In this letter Faraday expressed the hope that Davy would help him to attain his desire, and as a proof of his love of science he enclosed his carefully written notes on the four lectures he had heard. An interview followed, in which Davy advised Faraday to stick to bookbinding. The great chemist must have been favourably impressed by the earnestness of the youthful applicant, however, for a little later he went so far as to engage him to write for him for a few days, he himself having been injured in the eye by an explosion that occurred in the course of an experiment.



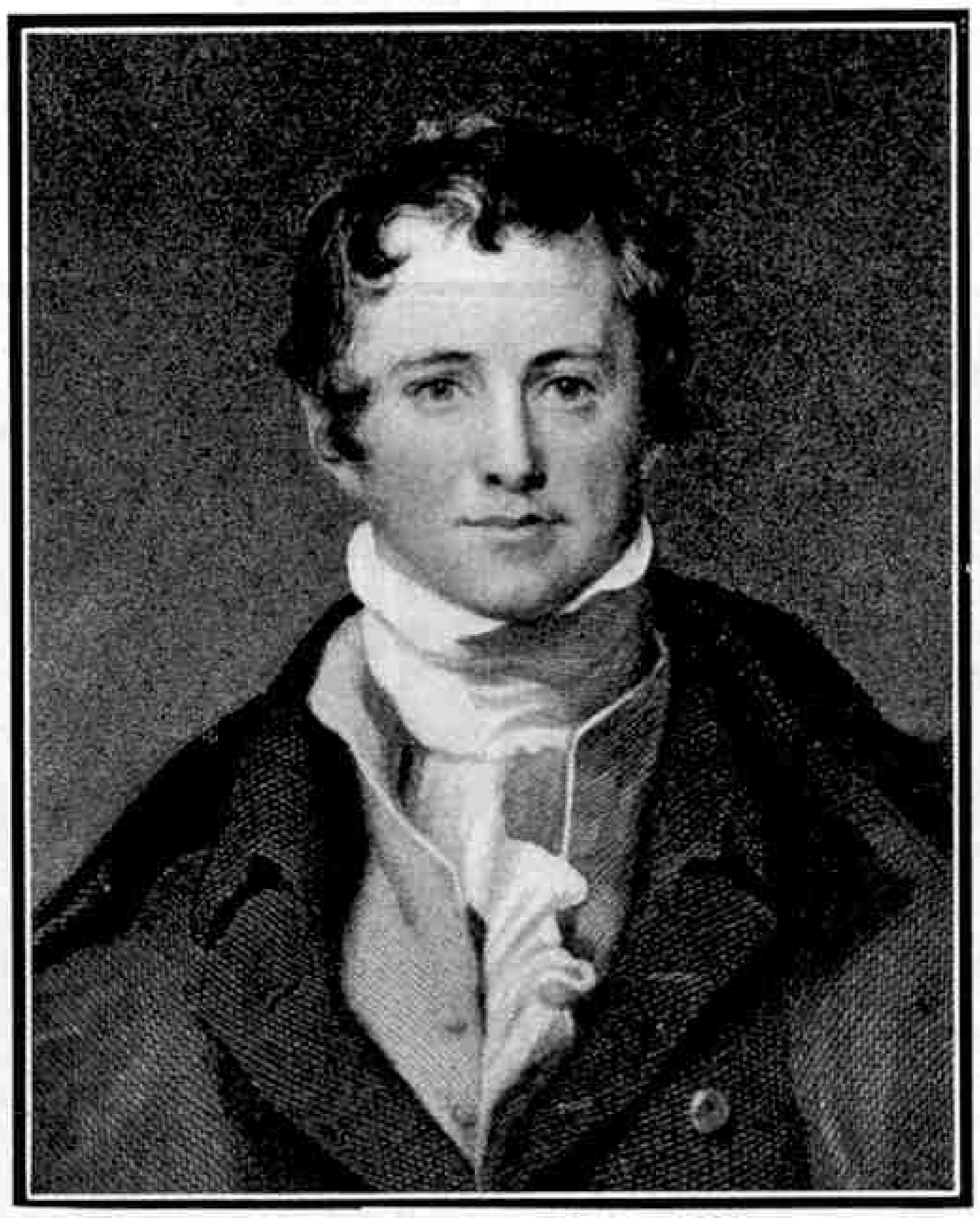
Faraday at work in his laboratory at the Royal Institution, London, in 1852. For this illustration we are indebted to the courtesy of the Royal Institution.

By this time Faraday's father had died, and his mother, who now lived in Weymouth Street, Portland Place, was maintaining herself by taking in lodgers, until her sons were in a position to support her. One night in the early days of 1813 the humble neighbourhood was disturbed by the arrival of a magnificent coach. From it alighted a footman who knocked loudly at Mrs. Faraday's door, and when this was opened handed her a note from Sir Humphry Davy, requesting Faraday to call next morning at the Royal Institution. The excitement that this event caused in the Faraday household may well be imagined!

When Faraday arrived at the Institution on the following morning Sir Humphry asked him if he still wished to give up bookbinding, and on being assured that this was the case, immediately offered him the post of assistant in the laboratory. The salary attached to this post was twenty-five shillings per week, with two rooms at the top of the building. Without hesitation Faraday accepted the offer, and thus commenced an association with the Royal Institution that was maintained throughout his career.

To a certain extent Faraday owed this wonderful opening to an accident. From time to time complaints had been made of the lack of zeal of William Payne, his predecessor in the post. Finally Payne's conduct grew outrageous, and after assaulting another attendant in the Royal Institution he was discharged. His sudden departure had been the cause of the haste with which Sir Humphry had approached Faraday.

Many stories are told of the manner in which Faraday came to be associated with the Royal Institution. One of these refers to Davy's reception of the bookbinder's appeal for employment of a scientific character. It is said that Davy showed Faraday's letter to a gentleman called Pepys, saying: "Here is a letter from a young man named Faraday; he has been attending my lectures and wants me to give him employment. What can I do?" Pepys immediately advised Davy to put Faraday to washing bottles, saying that if the applicant were good for anything he would do it immediately, while a refusal would show him to be good for nothing. This advice did not satisfy Davy, who replied that he must try the applicant with something better than that.



Sir Humphry Davy, 1778—1829.

This story is interesting, for it shows that Davy had already formed a high estimate of Faraday's capabilities, an estimate that was fully justified within a short time. In later years, when being congratulated on his discoveries, Sir Humphry would say: "Yes, but my best discovery was Michael Faraday!"

Faraday's duties were to keep the lecture room and laboratories in order and to take care of the scientific apparatus installed. It was particularly laid down that he was to clean and dust all instruments in cases at least once a month. He was also required to assist the professors and lecturers in preparing for their lectures, and in making the experiments shown in them. He was keenly interested in the work, but most of all he enjoyed assisting Davy in his experimental researches. A few weeks after his acceptance of the post he and Sir Humphry were injured during an explosion that occurred while they were working together, but it required more than an accident of this kind to deter either the experienced scientist or the beginner.

In September 1813, after only six months' work at the Royal Institution, a wonderful opportunity came to Faraday. Sir Humphry Davy was about to make a tour of the Continent, in which he intended to visit universities and laboratories in France, Italy and Switzerland. The tour was to occupy nearly two years, and he suggested that Faraday should accompany him as a kind of secretary. Faraday was now 22 years of age. He had seen nothing of the world, and he eagerly accepted the offer.

A journey to France was then a much greater adventure than it is to-day. Sir Humphry Davy's journey involved travelling to Plymouth by road and crossing the Channel to the port of Morlaix in Normandy. The party then went by coach to Paris. There Faraday obtained a glimpse of Napoleon I, but he was far more interested in Ampère, Humboldt, Gay Lussac and the other famous scientists he visited in company with Davy, and in the experiments that he and Davy made with iodine, then recently discovered by Courtois, a French saltpetre manufacturer, in the ashes of seaweed.

A tour of Italy followed. At Florence the travellers saw Galileo's own telescope, with which the great Italian discovered the satellites of Jupiter. They also saw a burning glass belonging to the Grand Duke of Tuscany, which had long been famous for its size. They used it to concentrate the rays of the sun on a diamond placed in oxygen, and the burning of the gem showed it to be pure carbon.

One of the most interesting events of the entire tour occurred on 17th June 1814, when Count Volta called upon Sir Humphry Davy at Milan, after specially attiring himself in a court uniform in order to welcome the distinguished visitor. Volta was the discoverer of the electric pile, the source of what was then called voltaic electricity, in order to distinguish it from the static electricity produced by friction. It was already known, of course, that there is no distinction between the two except that voltaic electricity, or an electric current as we should now term it, is electricity in motion. As we shall see, Faraday was destined to discover how to produce an electric current with the aid of magnetism, and from his work was developed the dynamo and the electric motor. Thus the visit brought together the two men whose work laid the foundations of the electrical engineering industry.

Throughout the tour Faraday greatly impressed the distinguished scientists with whom he came in contact, and they showed him almost as much respect as Davy himself, whose reputation was already world-wide. There is some ground

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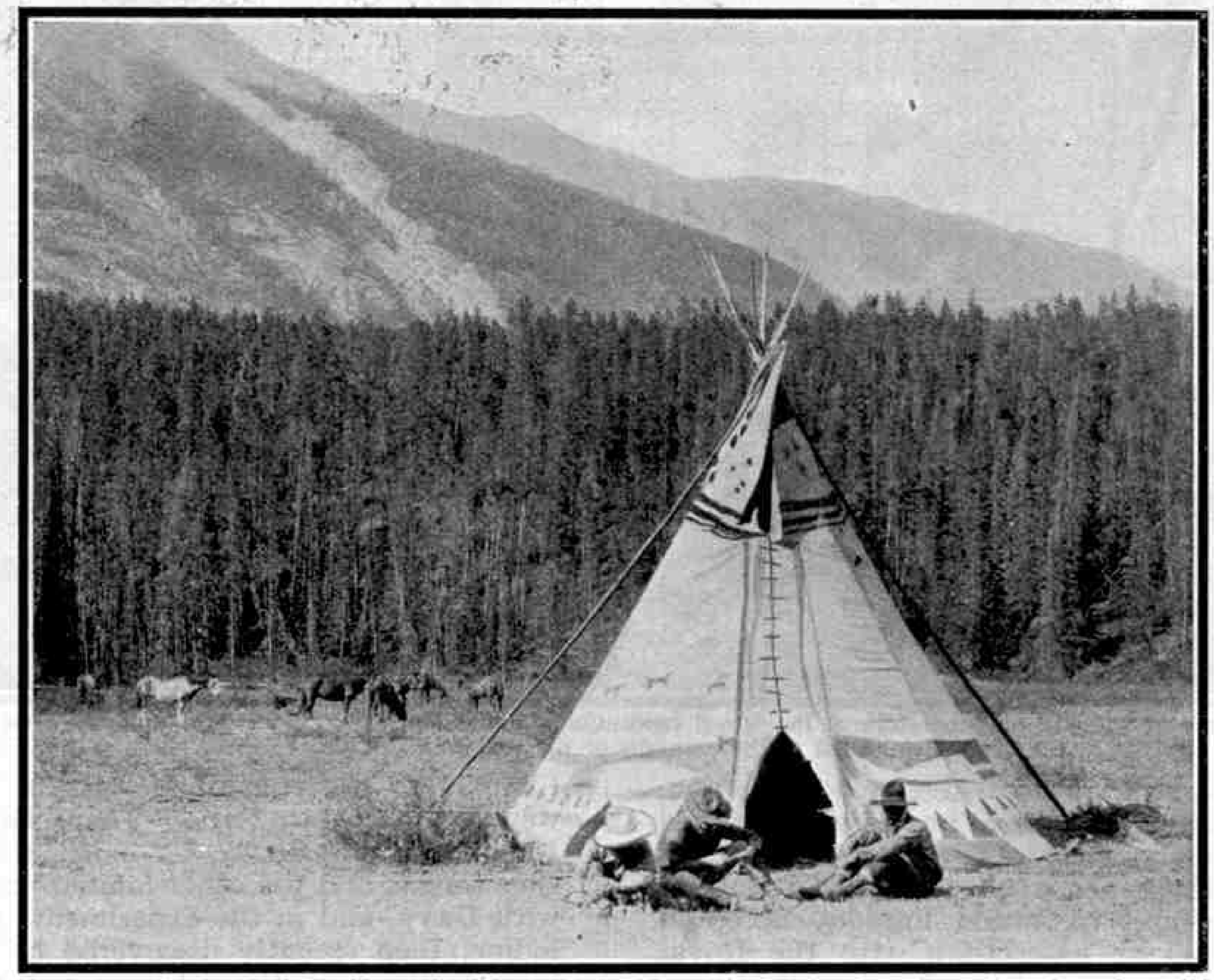
Camping Grounds in the Heart of the Rockies

The National Parks of Canada

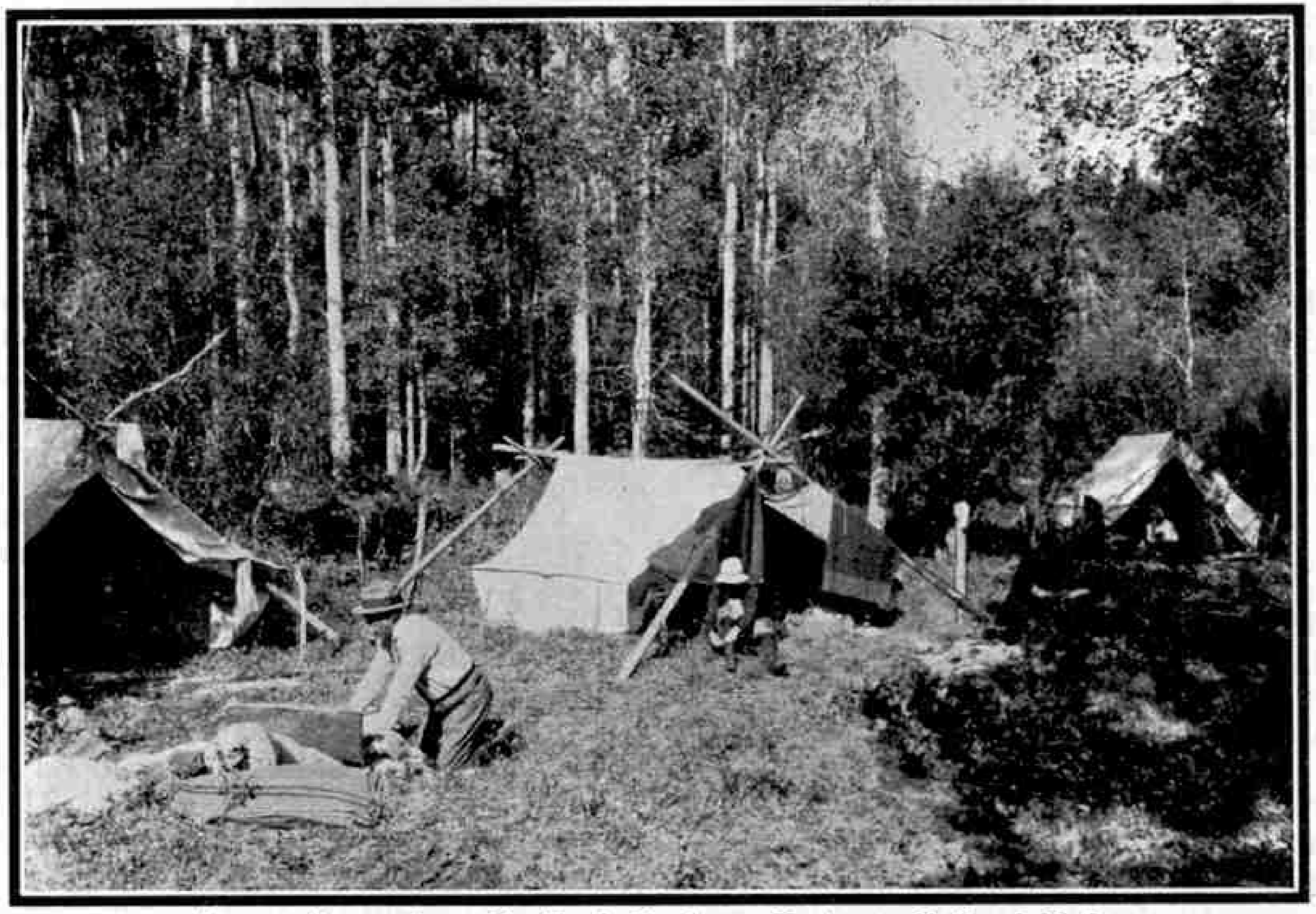
No country in the world is better provided than Canada with vast areas of unspoiled country in which the town-dweller can escape for a while from civilisation and enjoy the freedom of wild nature. Camping offers the greatest possibilities to those who feel the fascination of rivers, lakes, forests and mountains, and the camping habit in Canada grows rapidly year by year.

Camps may be divided into two main types, permanent and shifting. The permanent camp on the bank of a river or the shore of a lake, or perhaps on a small island, makes a special appeal to those who desire a quiet restful holiday spent perhaps in fishing or in easy journeys by skiff or canoe. The shifting camp attracts those who prefer to take their holiday strenuously, exploring the depths of the country and pitching their tent wherever they happen to be at the end of the day.



A camp at the head of the Alexandra River, Rocky Mountains National Park, at the edge of a wild region of forest and mountain.

Canada counts among her richest treasures her wonderful National Parks, great expanses of glorious country forming camping grounds of inexhaustible variety. The largest and finest of these is Jasper National Park in the province of Alberta. Just over 70 years ago the factor of the Hudson's Bay Company's post at Jasper House set up a notice that none but the company's employees were allowed to kill any wild animal within a radius of 30 miles of the post. This early prohibition of the destruction of wild life was followed in 1909 by the decision of the Government to set aside 1,200 square miles around the former trading post, as a national park and game preserve. Five years later this area was increased to 5,700 square miles. It is said that there are in this park more than 100 mountain peaks. Mount Columbia towers to 12,294 ft.; North Twin reaches 12,085 ft., and Mount Edith Cavell 11,033 ft. There are several peaks over 10,000 ft. in height, including Mount Scott, 10,826 ft., named after the Antarctic hero, and many peaks that are yet unnamed.



Among the poplars, MacCleod Meadows, Kootenay National Park.

Among the many wonders of Jasper Park is the Maligne River and Canyon. The river flows out of Maligne Lake, 14 miles long and one mile wide, the largest glacier-filled expanse of water in the Canadian Rockies. From the sandy beaches at the water's edge of this lake rise up mountains on all sides to a height of from 3,000 to 6,000 ft., and the elevation of the lake itself is about 5,600 ft. From Maligne Lake the river runs swiftly for 14 miles to Medicine Lake, more than 1,000 ft. below, where it vanishes. Its outlet from this lake has never been found. Ultimately it appears, apparently from nowhere, far below in the canyon, as a much smaller stream, only a shadow of its former self. Rushing along the canyon, it finally loses its colourful waters in the Athabasca River, a current of milk-white water—due to the silt and stone from the glaciers in which it rises—flowing swiftly towards the Great Slave Lake and the Mackenzie River, and so to the Arctic Ocean. The Maligne Canyon is one of the most spectacular in the Rockies. Its bed, cut unceasingly by the river during many centuries, is shut in by walls that rise in places to a height of 200 ft.; and at some points it narrows to a width of less than 10 ft. Huge pot-holes are to be seen, some of them more than 50 ft. in depth, cut out of the solid rock by the swirling waters.

The wild life of the park is extremely varied and interesting. In 1930 the animal census showed that there were in the park 7,000 wild sheep, 1,500 goats, 7,000 mule deer, 2,000 elk, 2,000 moose, 1,500 beavers, 300 grizzley bears, large numbers of black and brown bears, and enormous numbers of marmots, rock rabbits, squirrels, porcupines and smaller creatures. Traps are forbidden, and guns are not allowed in the park unless they are sealed. A good idea of the plentifulness of game is given in the following extract from the "*Canadian National Railways Magazine.*"

An automobile camp at the foot of Mount Rundle, Rocky Mountains National Park.

"On a hiking jaunt from camp to Wabaso Lake to locate new angling quarters, we came close to a caribou, with its horns in the velvet, and watched it for several minutes as it browsed on a hog-back hilltop. While casting from a raft in Wabaso Lake, two ewe lambs, at seventy-five yards, on the hillside, gazed at us curiously for ten minutes. A big black bear disturbed our slumbers at this camp and was chased by the camp cook. He came back on our return trip and posed for his photograph and the movies, while I walked to within six feet of him before he turned and lumbered down the trail.

The cooks at work ! A camp in the Byng Pass, Jasper National Park.

"On the trail to Athabasca Falls we saw three elk at short range, and a coyote, that slinkily oozed through the bush a few yards from where our pack horses were passing. Our Athabasca Falls camp was made in the shadow of Mount Kerkeslin, the towering snow peak of which was hidden in the mists. On a pasture at timber line we saw some white objects moving and with the glasses picked out twenty-one mountain goats. As our pack train wound slowly down a mountain toward beautiful Maligne Lake, after we had negotiated Big and Little Shovel passes, in a blizzard, a big buck deer watched us only a few yards from the trail. A deer came out to the salt lick the park warden had made near his barn at Maligne Lake, where we tarried two nights.

"Two goats were seen on the side of Mount Leah while we were on our way to Jacques Lake, and moose tracks were very plentiful leading to a salt lick at the head of Jacques. Deer, goat, and sheep also had left countless imprints in the soft trail."

In order to accommodate the ever-growing numbers of visitors to Jasper National Park, the Canadian National Railways have built and operate Jasper Park Lodge, situated on the shore of the beautiful Lac Beauvert, in addition to outlying camps at Maligne Lake, Medicine Lake, and elsewhere. At the dump about a mile from the Lodge, black and brown bears are to be seen every day feeding on the table refuse, and taking absolutely no notice of onlookers.

Mount Robson Park, 650 square miles in extent, and noted for its marvellously picturesque mountain scenery, has been set aside by the Government of British Columbia as a game and forest preserve. The centre and dominating feature of this park is Mount Robson, the highest and most majestic peak of the Canadian Rockies, rising to a height of 13,068 ft. Its pointed apex of ice can be seen for many miles from the train before it bursts into full view. The mountain lifts its head from 2,500 to 3,000 ft. above the surrounding peaks, which are themselves great mountains.

The peak rises majestically cliff on cliff to its summit, where the vapours of the Pacific gather almost every day in the year. The snow clings to the sides of the upper peak in long ribbons reaching to the crest. Below, it forms two streams of ice, the Mist Glacier and the Tumbling Glacier. The latter extends two miles in horizontal distance and has a vertical descent of 6,000 ft. between the snow cornices of the mountain and its foot at Berg Lake, where the ice is thrust down to the water to break away and float off in bergs. The first ascent of Mount Robson was

(*Continued on page 662*)

The Epic Ride of Sir Harry Smith

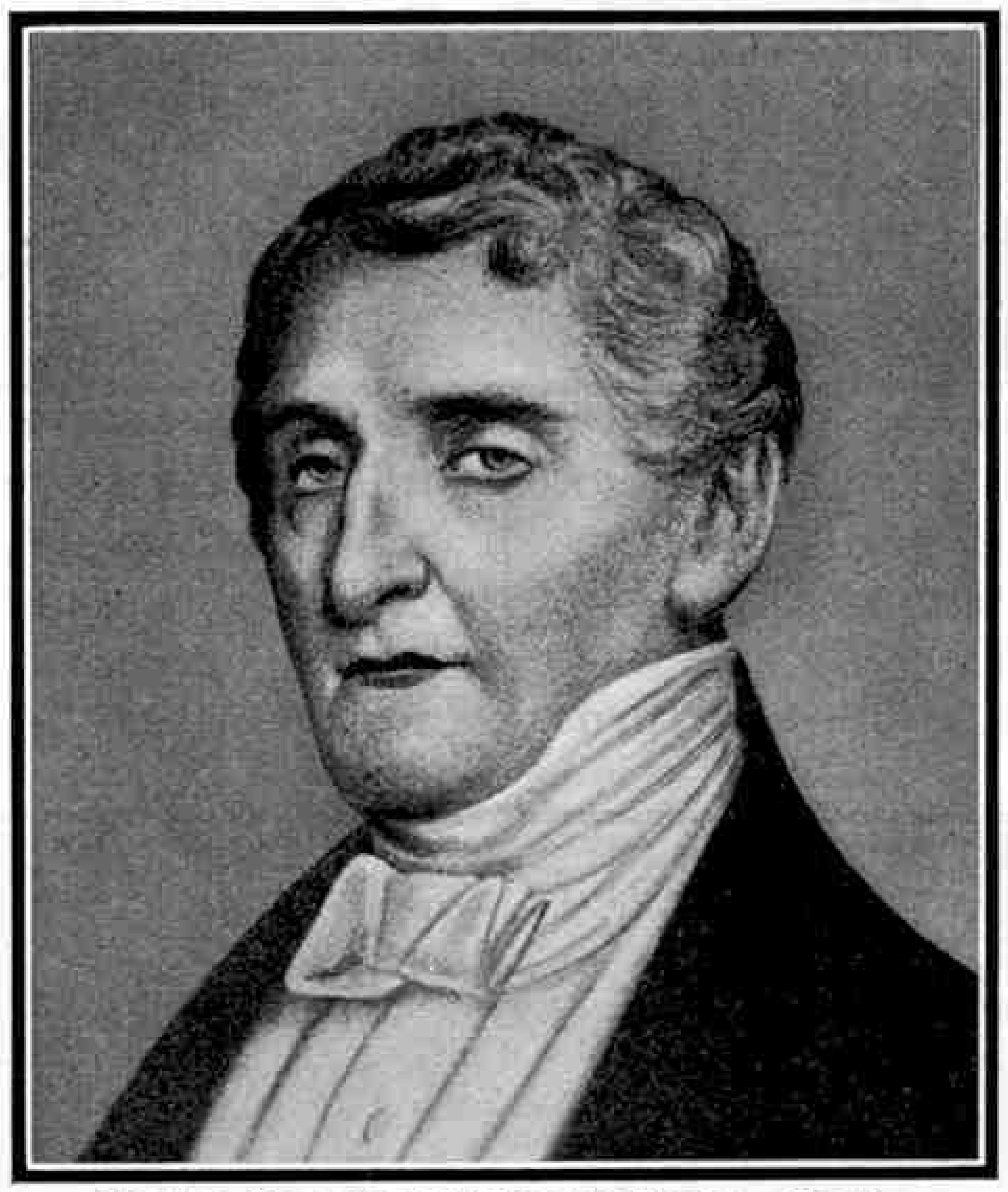
Stirring South African Episode of 1835

A LITTLE more than a century ago civilisation's thin advance guard in and about the area now embraced by the prosperous and progressive Albany and Bathurst districts of South Africa was faced with the danger of extermination. The native battle-cry had reverberated ominously through the land, the white man's blood dripped from the warrior's assegai, his crops had been plundered, his cattle stolen, and if he and his family had escaped with their lives they were fortunate indeed.

The echoes of these tumults were heard in far-away London, and the time came when the Government grasped at an opportunity to relieve a difficult situation in Britain, where depression was then at its height, and at the same time to provide reinforcements to assist settlement in its battle of savagery in South Africa. A scheme was evolved whereby some 3,400 immigrants were landed at Port Elizabeth in 1820. The British Parliament provided £50,000 to meet the cost of conveying from England these men, women and children, who were to assist in the colonisation of South Africa.

When the settlers landed at Algoa Bay, Port Elizabeth was a rough and ready little settlement. Newcomers moved into the interior and established themselves over a radius of many square miles around Grahamstown, with Bathurst as their first administrative centre. In kloofs and valleys where for years only wandering tribes of bushmen and natives and trekking Dutch farmers had pastured their cattle, the colonists' homes appeared. The 1820 settlers had become a factor in the land of their adoption.

But the black hordes came to lust again for the white man's land, and for his cattle and blood; and a few days before Christmas of 1834, a barbaric army, probably nearly 15,000 strong, surged into the territory occupied by the settlers. The native warriors, extending in a line 30 miles in length, brought ruin to the lonely homesteads that lay in the path of their frenzied march. Here a homestead was burned; there a settler and his family, unable to escape, were murdered. Cattle and sheep numbering a quarter of a million were stolen, and more than 450 homesteads were razed to the ground.



Major General Sir Harry Smith, Bart.

It was not until the last evening of 1834 that news of the plight of the Albany settlers reached the Governor of the Cape Colony, Sir Benjamin D'Urban, who promptly handled the situation with resolution. He, and one of his right-hand officers, Colonel Harry Smith (later Sir Harry Smith), were heroes of many battles. Sir Benjamin had fought all over the world for his country, and in the Peninsula War alone he had taken part in nine pitched battles and sieges. Colonel Smith was another veteran of the Peninsula campaign; he had been in almost every fight from Corunna to Waterloo, and had enjoyed them all! He had helped to lead the storm of Badajoz in Spain, undertaken in 1812 under the generalship of the great Wellington. During the sack of Badajoz two Spanish ladies threw themselves on the mercy of Smith and another officer. One of them was destined to become Colonel Smith's wife, and after her, as history reminds us, Ladysmith in Natal was named.

Sir Benjamin D'Urban ordered Colonel Smith to proceed post-haste to Grahamstown, 600 miles distant, with full powers, civil and military, to adopt whatever measures he deemed necessary; and scarcely had the command been spoken when the gallant soldier was riding hard towards the arena of battle. It will be well here to extract a little from Sir Harry Smith's diary, so that the bold nature of the enterprise may be the better understood. He wrote:—

"At about 4 a.m. on the 1st January, 1835, I set out on the first lap of the ride to Grahamstown, and that day covered ninety miles. My orders and other documents had been sewn, by my wife, into the lining of my jacket. As a consequence of exertion to which I had been subjected the previous day, and due also to lack of sleep, it was with a feeling of weariness that I rode the first twenty-five miles, but at the first post-house on the way I was given a cup of tea, and at no other time on the entire journey did I feel tired.

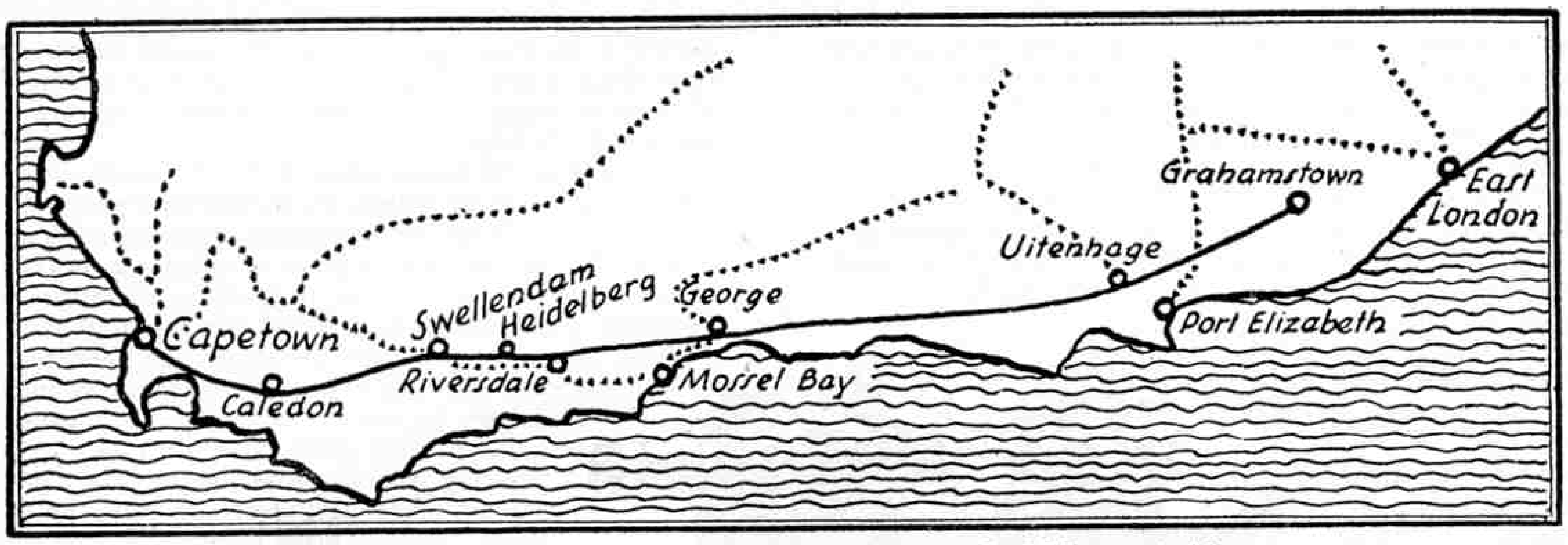
"It was at 1 p.m. on New Year's Day that I dismounted at Caledon. A severe thunderstorm swept over the countryside as I continued my ride, but by some miraculous chance I continued on the outskirts of the downpour, and at three o'clock in the afternoon, when I again off-saddled, I was perfectly dry. Field-Cornet Leroze had awaited me at this halting-place, and with that good host I remained until daylight the following morning, when I took to the road again, and was so well favoured in my effort that I breakfasted at Swellendam. Thereafter I set out on a seventy-mile section of the route. Had plans not somewhat miscarried, my first mount from Swellendam would have carried me for twenty miles, but owing to a flooded river I had to deviate some distance from my course, so that the noble horse carried me thirty miles in all, and also bore me safely across a much swollen water-course. This thirty-mile lap, over rough country, and embracing a river which occasioned difficulties and delay, was covered in two hours and twenty minutes."

When Smith reached George, he found the civil authorities and all the residents of the place ready to receive him, for despatch bearers ran or rode night and day from point to point on Smith's route. In this manner tidings of the ride, and the requisition for a fast and well-rested horse to replace the officer's exhausted mount, had reached the pretty settlement in the shadow of the Outeniqua Range.

Smith spent the night at George, but was away in the uncertain light of the morning, following a heavy track over mountainous and desolate country. About midday he met the post-conveyance with mails from Grahamstown, and from letters that he seized, came into possession of appalling descriptions of disaster, murders and devastations around Grahamstown. He learned of a situation become so desperate that the Commandant considered the evacuation of the town desirable. Referring to this meeting with the mail, Smith wrote: "The heat of the day, and the exertion of opening the letter-bags were fatiguing. In view of what I had learned, from my next halting-place I sent on special despatches, instructing that the horses at points ahead were to be ready a day earlier than previously arranged, for I was determined to reach Uitenhage the next day, my fifth from Cape Town, and 500 miles from my actual starting point at the Governor's house."

Next morning before daylight Smith was on the road, and so winding was one of the rivers lying across that particular section of the way that he crossed the watercourse seven times, sometimes having to swim his passage while leading his horse. On that road to Uitenhage his mount, exhausted by the speed of the journey and the great heat of the day, broke down completely. About half-a-mile away Smith observed something of a camp, and making his way there on foot came up to a farmer who, with his wife and children and herds of flocks, was fleeing from the devastation spread by the natives. Smith revealed his identity and explained his dilemma, but the farmer stubbornly refused to provide him with a horse to carry him to his next halting place, about seven miles distant. That was not the time for the observance of the niceties of behaviour and, knocking the man down, Smith seized a fresh-looking animal, ready saddled, which the farmer had been holding, and was quickly away again. He reached Uitenhage at five o'clock in the afternoon, having ridden, since three o'clock on that morning, 140 miles over execrable and mountainous roads.

At dawn on the sixth day Smith was again in the saddle, and between Uitenhage and Grahamstown found the country in the grip of unbridled terror. To right and left of him, and in his path, families from the farms were hastening seaward panic-stricken by the native atrocities they had so narrowly escaped. When perhaps half of that last lap had been covered, a body of armoured burghers joined Smith, and together with a party of Cape Mounted Riflemen who met them later, escorted him into the barricaded centre of defence.



Sketch map showing the route of Sir Harry Smith's great ride.

Grahamstown, under the command of Smith, at once came to represent a changed complexion. Martial law was proclaimed, and Smith directed that a volunteer corps should be formed, a measure that the leading townsmen met to discuss. To that meeting Smith went and demanded to know the reason of the delay in the carrying out of his order; whereupon a man in the assembly attempted to enter into argument concerning the wisdom of the proposal. "I am not sent here to argue, but to command," replied Smith in a stern tone. "You are now under martial law, and the first gentleman, I care not who he may be, who does not promptly and implicitly obey my command, he shall not even dare to give an opinion; I will try him by court martial and punish him within five minutes."

The situation was soon thoroughly in hand, and in the severe fighting that followed—in which Sir Benjamin D'Urban, who in the meantime had reached Grahamstown with reinforcements, took a great part—the natives were completely routed.

Hintza was the chief of the black armies that had caused so much suffering and ruin and loss of life. Out-manœuvred and out-fought, he sued for peace, and while negotiations were afoot he was held as a hostage by the European forces. Smith had impressed on Hintza the extreme penalty he might be called upon to pay if he should attempt to escape from custody. The warning went unheeded, however, for the prisoner made a bid for liberty while riding with a detachment of soldiers in charge of Smith to a native settlement, where certain of the terms of surrender were to be ratified.

The chief was well mounted, and away he raced with Smith in hot pursuit. The black headed for a large native kraal, where at any rate some security would be afforded him, while a shower of assegais would certainly greet his pursuer. When the native huts were dangerously near at hand, Smith drew level with the chief and pulled the trigger of his pistol, but the weapon misfired. Hintza, resplendent in his tiger skins, and armed with his assegai, answered the attack by stabbing fiercely at Smith, but his onslaught was without effect. Then, by a bold manœuvre Smith dragged the black from his horse. At this instant Smith's horse, terrified, bolted with its rider, and in the meantime the chief dashed towards a neighbouring thicket. Unfortunately for him, Richard Southey, whose name is illustrious in South African history, had followed the duellists, and by a shot from his gun closed the career of the truculent Hintza.

For the facts upon which this article is based, and for the illustrations, we are indebted to the courtesy of the "*South African Railways and Harbours Magazine.*"

Exploring the Antarctic

—(*Cont. from page 613*)

clear the head of the pass, but Balchen realised that he would have difficulty in doing so, in spite of the fact that he had opened out the engines to full throttle. He was heard to shout "Overboard! 200 lbs.!" The weight could only be brought down by throwing out petrol or food, and the decision had to be made immediately. Without hesitation Byrd turned to order a food bag to be thrown overboard, to find that McKinley had already hauled one to the trap door, for all were determined to keep in reserve sufficient petrol to ensure the success of their flight. The bag was pushed out and another quickly followed it, the two between them containing enough food to keep four men for a month. The sacrifice was a great one, for it practically meant starvation if the aeroplane were forced down after crossing the mountains, but it was successful, and the pass was cleared with 500 ft. to spare.

The rest of this famous journey by air was comparatively uneventful. When calculations showed that the Pole had been reached, Byrd flew onward for several miles, and also made a circular flight, in order to make sure that he had been over the Pole. Then the return flight was commenced. This also was without incident, but the occupants of the machine were kept hard at work and the strain of the continuous flight began to tell on them. A landing was made at the depot that had been established on the trial trip, after which the machine was flown back to Little America thus concluding a brilliantly successful flight that added greatly to our knowledge of the Antarctic.

Famous Inventions

—(*Continued from page 619*)

shortly before the Great War, and even this disc, when received and tested in America, was found to contain several minor flaws in the interior of the glass. Such flaws are not so important in a mirror as they would be in an object-glass, in which the light passes through the lens.

In the meantime the French glassworks had been destroyed during the German advance through Northern France. As another disc could not be cast, the observatory authorities decided to use the one they had received, and it was sent away to be ground to the correct curvature and polished. In its rough state the disc was 101 in. in diameter, 13 in. in thickness, and slightly over five tons in weight. Grinding was done with fine emery powder applied by wooden brushes covered with cheese-cloth, and more than a ton of glass was removed in this manner. The disc was next coated with silver by a chemical process, and was then polished. The grinding, silvering and polishing of the mirror took four years to complete.

Glass is a bad conductor of heat, and in consequence the mirror of a large telescope does not readily take up a uniform temperature over its entire surface. It is also liable to bend under its own weight. Either of these causes may slightly distort the mirror and impair the definition. An elaborate system of fans and heating coils is employed to keep the 100-in. mirror of the Mount Wilson telescope at as uniform a temperature as possible and the glass is surrounded by an insulating chamber of cork.

The mounting of a large telescope must combine absolute rigidity with the greatest ease of movement. Every girder used in building up the support is mathematically tested to ensure that there is no doubt of its ability to support the instrument without yielding in the slightest degree. Each metal part must be made with the utmost precision, so that when the mounting is erected it will form a perfect whole. The moving parts of the 100-in. telescope have a total weight of 100 tons, but so accurately is the mounting designed and erected, and so finely adjusted is the telescope, that immediately the astronomer presses a button the instrument moves as easily and smoothly as if it were almost without weight.

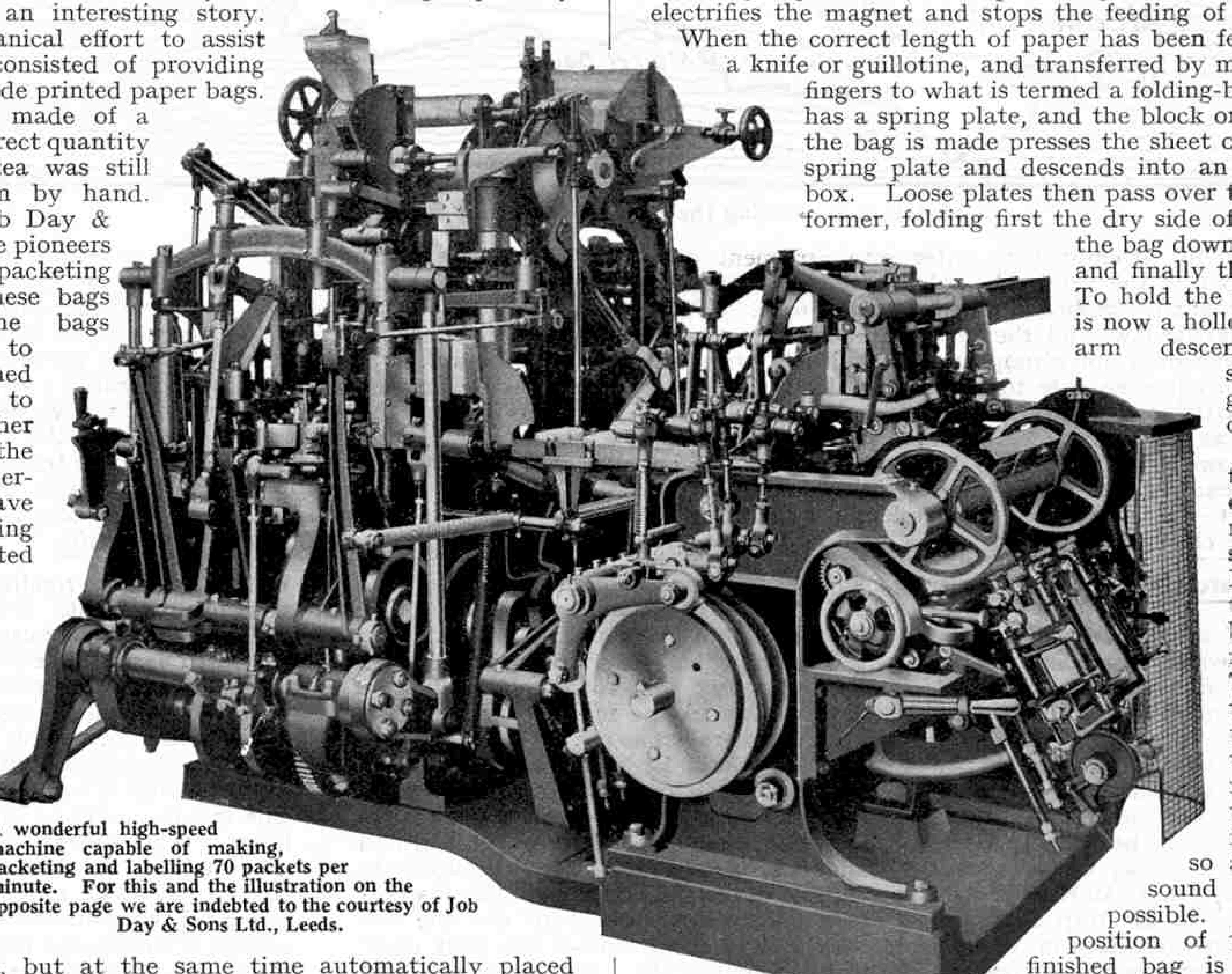
A vast amount of valuable work has been accomplished with the Mount Wilson telescope. Most of the observations that are made with this and other large modern telescopes are carried out photographically, and the astronomer spends only a small proportion of his time in operating the instrument. The camera is fixed to the eyepiece of the telescope, the instrument pointed at the celestial object to be photographed, and the clockwork mechanism carefully adjusted so that the telescope will remain accurate in direction for a sufficient length of time.

In spite of the fine work that has been done with the 100-in. telescope, plans are already in hand in the United States for the construction of a giant telescope of 200 in. aperture. This also will be a reflector and its mirror will be ground from a huge block of fused quartz instead of glass. The 200-in. telescope is to be the main instrument in a new observatory and laboratory to be erected by the California Institute of Technology.

Tea Packeting by Machinery

Bags Made and Filled at 70 per Minute

EVERYBODY is familiar with the neatly-shaped little packets in which most of us buy our tea from the grocer. Twenty-five years ago all the tea that was sold in England was weighed and wrapped up in the grocer's own shop. That was the period in which each family grocer used to sell his own particular blend of tea, which of course was always of better quality or cheaper than the teas sold by rival grocers ! Most of the tea sold nowadays is packed by machinery, and the manner in which these small packets are produced automatically and at very high speed by machinery forms an interesting story.



A wonderful high-speed machine capable of making, packeting and labelling 70 packets per minute. For this and the illustration on the opposite page we are indebted to the courtesy of Job Day & Sons Ltd., Leeds.

The first mechanical effort to assist the large grocer consisted of providing a machine that made printed paper bags. These bags were made of a size to hold the correct quantity of tea, but the tea was still packed into them by hand. A Leeds firm, Job Day & Sons Ltd., were the pioneers in producing a packeting machine to fill these bags automatically, the bags being folded so as to produce a finished packet. In order to meet the further requirements of the wholesale tea merchants, and to save labour, a bag-making machine was invented that made a paper bag and then automatically transferred it into the packeting machine, which filled it with tea. As time went on the demand arose for a bag - making and packeting machine that not only produced the packet, but at the same time automatically placed a label on the finished packet to secure it.

In this case, as with all other automatic production processes, the constant demand has been for a machine that should give the greatest possible output per day. The earliest machine produced from 10 to 12 packets per minute ; Messrs. Day's latest machine produces from 60 to 70 packets per minute.

The working of the tea-packeting machine is extremely interesting. At a first glance the machine appears to be a complicated mass of quickly moving parts, but closer examination reveals the fact that each individual operation has its own particular motion. The various moving parts are usually operated by means of revolving cams of such a shape that they actuate their particular part of the machine at exactly the right moment, and enable it to perform its task in a definite period of time. The designing of these various-shaped cams is a very intricate piece of work, for as many as six different motions have to follow one another, and the whole of them have to operate in slightly less than one second.

The general operation of one of these tea packeting plants resembles that of a large newspaper printing press in that the paper for forming the packets is taken from large rolls carried on the machine. As a general rule two reels of paper are used, one for the outside wrapper and one for the inner lining, the latter being usually a grease-proof paper to preserve the flavour of the tea. The paper is passed between two rollers, which are revolved by means of a reciprocating pawl and ratchet wheel in such a manner as to deliver the exact length of sheet required to produce a bag. During the progress of the outer wrapper from the reel of paper to the feed rollers, a narrow seam of gum is placed on its edge.

At this stage in the process, the reciprocating pawl of the ratchet wheel is held out of action by means of a magnet that is operated from electrical weighing machines overhead. The purpose of this is that should, for any reason, a weighing machine fail to deliver the weighing of tea to the packeting machine it automatically electrifies the magnet and stops the feeding of a sheet of paper.

When the correct length of paper has been fed it is cut off by a knife or guillotine, and transferred by means of travelling fingers to what is termed a folding-box. This usually has a spring plate, and the block or former on which the bag is made presses the sheet of paper on to the spring plate and descends into an open rectangular box. Loose plates then pass over the top of the bag former, folding first the dry side of the seam fold of the bag down on to the former, and finally the gummed seam. To hold the paper bag, which is now a hollow tube, a narrow arm descends and holds securely the gummed portion of the bag.

The former is then raised out of the box and revolved into a second position. Here the end of the bag is closed by means of folders or fingers. The former is then revolved to a third position of the bag - making machine, where the end of the bag is securely pressed so as to make it as sound and airtight as possible. At the fourth position of the machine the finished bag is stripped off its former and conveyed into a hollow box or die, which forms part of the packeting machine. A number of dies are moved in stages round a rectangular box to various stations on the packeting machine.

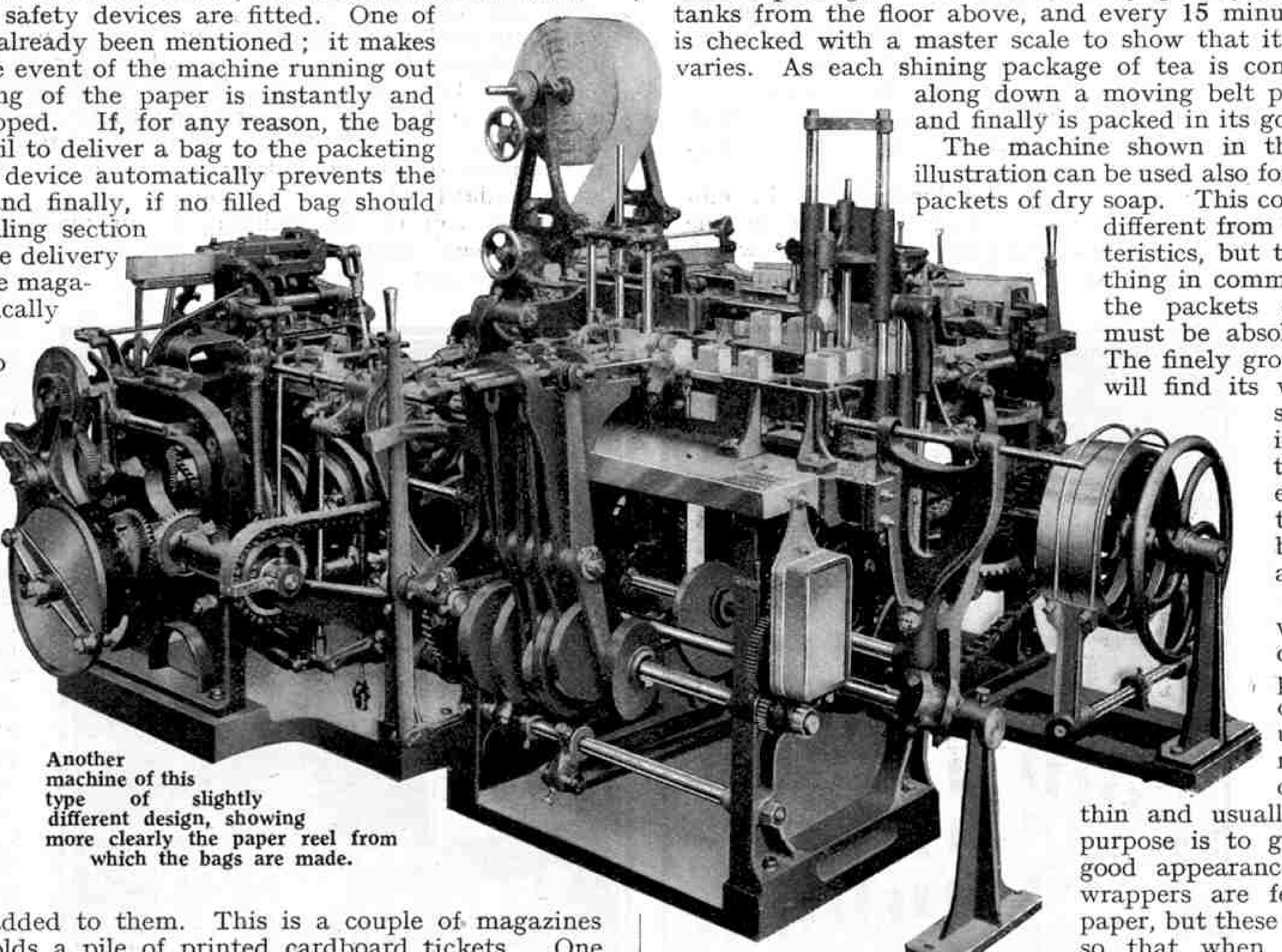
The next operation is carried out by means of an electric device, which has the effect of feeling whether there is a bag in that particular die, and which governs the delivery of the required weight of tea from the electrical weighing machines. The tea is stored in large hoppers, each of 2,000 lb. capacity and generally situated in the floor above, and is delivered by means of chutes into the weighing machines, which in turn automatically deliver the required weight of tea to the packeting machine at exactly the right moment. These weighing machines are placed directly over the packing machine in the position in which the bag is to be filled. The weighing of the tea and the filling of the bag have to be carried out to such a degree of accuracy that the variation in weight does not exceed two or three leaves.

After the bag has been filled it passes over a vibrator, which shakes the tea as tightly as possible into the bag. At another position of the machine a plunger descends into the filled bag and presses the tea level with the top of the box or die. The object of this is to ensure that each packet shall be of exactly the same length, and that when it reaches the next position of the machine, the folding motion that folds in the top of the packet shall work freely.

The folding in of the top of the packet on to the tea is very interesting. First of all the front portion of the bag is turned down. Then little fingers, which seem almost human in their action, proceed to turn down first one side and then the other, leaving a pointed ear, which in turn is pressed by another finger, and then turned over and flattened on to the top of the packet.

This completes the cycle of operations on the packeting machine. The packet is then ejected from the die, and automatically conveyed to another section of the machine. This consists of a magazine that feeds a printed sheet of paper on to a plate that previously has been gummed; and this, in turn, transfers it to the filled packet, both arriving at the same position at the same time. The label is usually placed on one side and on two ends of the packet. When the labelling machine has done its work, the whole of the operations are completed, and a packet similar to those that may be purchased at any grocer's shop is now ready to be parcelled up with others and boxed away for despatch to the various shops as required.

In order to ensure that the machine will operate with the smallest possible amount of attention, various automatic mechanical and electrical safety devices are fitted. One of these devices has already been mentioned; it makes certain that in the event of the machine running out of tea, the feeding of the paper is instantly and automatically stopped. If, for any reason, the bag machine should fail to deliver a bag to the packeting machine, another device automatically prevents the supply of tea; and finally, if no filled bag should arrive at the labelling section of the machine, the delivery of a label from the magazine is automatically checked.



Another machine of this type of slightly different design, showing more clearly the paper reel from which the bags are made.

In addition to making packets from paper the machine can produce packets made from aluminium foil, and these have an exceedingly smart appearance. When working with this material (or with lead foil similar to that used in England during the early days of tea packing) the packeting machines have another feature added to them. This is a couple of magazines each of which holds a pile of printed cardboard tickets. One ticket is inserted into the bottom of the packet prior to delivery of the tea, and a second ticket is placed on the top of the tea when this is pressed down to the required height before the top of the packet is folded in. The tickets have to be as near as possible to the exact size of the metal bag, and the making of a device to ensure that the first ticket goes right down the empty packet and lies flat on the bottom formed a very interesting mechanical problem that has been ingeniously solved. The mechanism, however, is rather too complicated to describe in this article.

The reason for the alternative type of package is that in the English tea trade a packet of tea is so quickly sold that the paper wrapper is sufficient protection. In the case of Overseas trade the conditions are vastly different, and foil packets are used for tea exported in packages. After shipment abroad the packets of tea may eventually find their way to the small store of some outlying district, where they may remain in stock for some time before they are sold for consumption; and where they may come into contact with all kinds of substances which the average English grocer would not allow to be on his counter. The metal wrapping, which is practically air-tight, effectually protects the tea from contamination. The value to the large tea companies of machinery such as we have described is very great; in fact they could not carry on business without it. Take, for instance, the Salada Tea Company, Inc., which has in Boston, Mass., U.S.A., the largest building in the world devoted exclusively to the merchandising of tea, in addition to magnificent buildings in Toronto and Montreal. On the eighth floor of the Boston building the original metal-lined tea chests from the high hillside gardens of Ceylon and India are broken open by workers wearing white gloves, and the contents are poured into huge hoppers in definitely determined proportions, in accordance with a carefully prepared formula. From this point the tea leaves flow by gravity down through all the various floors and processes to the shipping department.

The blending process begun on this floor is continued on the floor below in enormous tea-blending machines. Each of these consists of a huge revolving drum capable of holding 4,000 lb. of tea, which is poured in from the hoppers on the floor above. These machines revolve very slowly, and gently mingle and blend together the various teas that are required to secure absolute uniformity of flavour and aroma. When the blending is complete, the tea may be distributed to any one of several storage tanks on the floor below, flowing gently down sloping tubes of burnished brass that radiate from the drums.

On the fourth floor are the delicately-adjusted and accurate automatic machines made by Messrs. Day of Leeds. From each of these machines come an average of 85,000 sealed packages of Salada tea per week, making a weekly total of nearly one million packages. The tea flows by gravity from huge storage tanks from the floor above, and every 15 minutes each weigher is checked with a master scale to show that its accuracy never varies. As each shining package of tea is completed, it glides along down a moving belt past an inspector, and finally is packed in its going-away carton.

The machine shown in the accompanying illustration can be used also for making up ¼ lb. packets of dry soap. This commodity is quite different from tea in its characteristics, but the two have one thing in common, namely, that the packets containing them must be absolutely dust-tight. The finely ground soap powder will find its way through the smallest aperture in the folding, and the method adopted to prevent this leakage is both uncommon and interesting.

The inner wrapper is made of fairly stout paper with plenty of body, to hold up the packet and make it firm; the outer wrapper is thin and usually shiny, and its purpose is to give the packet a good appearance. Both these wrappers are fed from reels of paper, but these reels are arranged so that when feeding the two wrappers together, the length of the outer one is about 1 in. greater than that of the inner one. In passing through the feeding apparatus the outer wrapper is gummed on one edge, and spots of gum are placed in the centre. At the right moment the two papers are gummed together in such a manner that the outer one protrudes about ½ in. beyond each end of the inner wrapper.

The length of the stiff inner lining is such that when the fold is made on the top and bottom of the packet it extends just to the other side of the packet. The outer wrapper however, being longer, extends to the other side of the packet, and is also turned up at right angles. In the completion of the folding this has effect of making what is called an interlocked fold; and a packet folded in this manner, after being labelled, is so well made and dust-tight that it is possible to throw it on to the floor without any of its contents escaping.

A measuring machine is generally used for feeding the powder to the packeting machine. This machine consists of either a reciprocating or a revolving slide with suitable openings passing underneath a hopper kept constantly filled with powder, so as to maintain an even supply. One or more scrapers, similar to knives, are used to scrape off any surplus powder from the opening when this is passing underneath the hopper, and it is surprising how high a degree of accuracy can be attained by this simple process.

It is usual to fit an automatic device on the packeting machine when a measuring machine of this type is employed, so that in the event of a bag failing to be delivered from the bag-making portion of the machine, the chute or funnel that delivers the powder into the packet is immediately swung into another position. In this position the measured powder is diverted into a special hopper provided for the purpose, from which it returns to the original feeding hopper.

Floodlighting in Changing Colours

A Striking American Installation

A PRACTICE that is rapidly becoming popular, particularly in the United States, is that of lighting up buildings by means of rays from giant searchlights, or floodlights as they are more usually called. As a rule the lamps employed are hidden from sight, and only the rays reflected from the walls on which they are directed reach the eyes of the onlookers. Careful placing of floodlights brings into relief the architectural features of a building in a remarkable manner, and in some instances has the extraordinary effect of making a structure more attractive in appearance than it is by daylight.

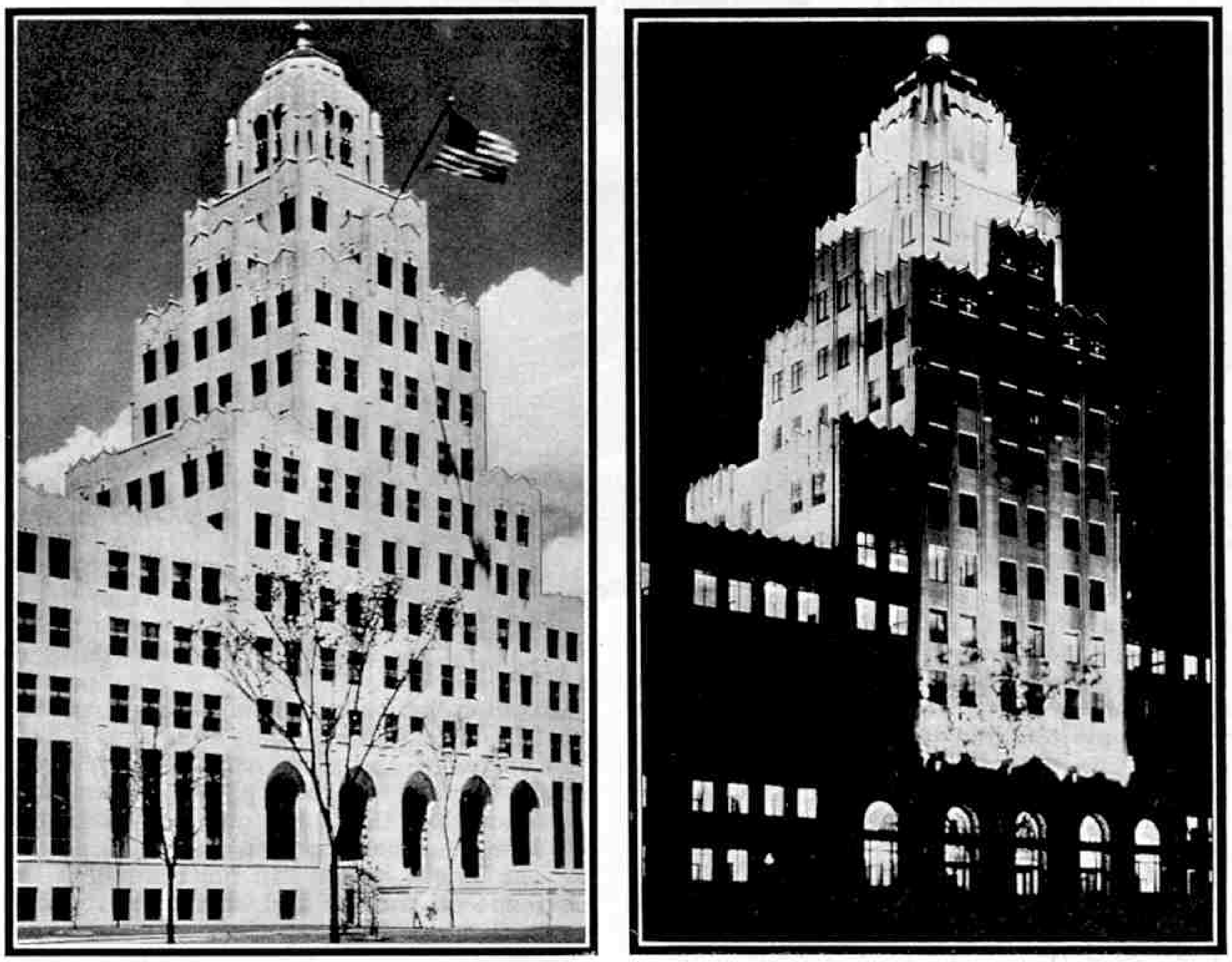
An excellent example of the use of floodlighting in emphasizing the features of a large building is shown in the accompanying illustrations. The building is that in which are situated the offices of the A. E. Staley Company of Decatur, Illinois. It is situated on the outskirts of the town, where it forms a very prominent landmark both by day and by night. It is specially attractive at night, because of the unusual nature of the floodlights employed; for not only are these carefully distributed for the purpose of bringing out the best architectural features of the structure, but also they bathe part of it in colours that are continually changing.

The building is constructed of evenly-matched light grey stone, and is illuminated by 195 floodlight projectors provided by the General Electric Co. Inc., to whom we are indebted for the illustrations to this article. The architectural design has made possible floodlighting in sections. The chief aim has been to illuminate the central tower that is the most prominent feature of the building, and the greater part of this is bathed uniformly in white light. The sides as well as the front of the tower are floodlighted. The 11th, 12th and 13th floors are set back, the terraces thus formed making excellent positions for the projectors. The corners of the higher storeys are special features of the design, this being particularly noticeable at the 13th floor, where there is an important group of flying buttresses. In the floodlighting system the corners at the 11th and 13th floors, and the central panels at the 12th and 13th floors, form the sections that are illuminated in colours.

Of the total number of projectors employed, 15 are set on the third floor level above the entrance to the building, in order to illuminate the front. On the sixth floor elevation are 12 projectors that throw a flood of light on the sides and back of the central tower; and 12 others at the level of the eighth floor illuminate the sides of the main structure and the flower gardens that have been laid out on the terrace on which they are placed.

The remaining 156 projectors are used in the colour lighting system. Lenses transmitting blue, red, amber or white light are used in the projectors, and great care has been taken to produce an effect of uniform intensity. For instance, it was found that in order to allow for the different visual effects of blue and white, it was necessary to employ blue lamps three times as powerful as those used for white light. Amber light is practically equivalent to white light, but the power of the red lamps used must be twice that of the standard white light projectors.

At the top of the building is an overhanging ornamental stone screen that forms the enclosure for the portion of the tower just below the octagonal cupola that surmounts the entire structure. The details of this screen are silhouetted against a red dome, the background being illuminated by means of eight neon tubes of a new type that has been perfected in the research laboratory of the General Electric Company. Three of these tubes also are mounted within the cupola, the windows of which are aglow with their light. In addition, a 24-in. rotating beacon with a "Spredlight" lens is installed. This lens is of a special type that enables a beam of the same shape and size as the windows of the cupola to be sent out; and as it revolves an intense beacon of white light is projected through each window in turn.



(Left) The office building of the A. E. Staley Manufacturing Co., Decatur, Illinois, as seen in daylight.
(Right) The same building by night. The top of the central tower is bathed in constantly changing colours.

The coloured lights in which the upper portion of the central tower of the building are bathed vary continuously. A complete change of colour is brought about every 15 seconds, but no single combination of colour effects is repeated for a period of 22½ minutes. There are no jumbled combinations, the colours always harmonising with each other; and the control is arranged in such a manner that certain colours may be retained for a definite portion of the cycle of changes, while the remaining colours continue their variations. This feature greatly increases the number of possible colour combinations that may be used.

No moving contacts or mechanical switches are employed. The changes are governed by thyratron tubes, which are members of a numerous family of vacuum tubes developed by the General Electric Company for the control of electrical energy. These tubes effect the necessary changes in the intensities of the coloured beams from the projectors, by allowing constantly changing colours to be superimposed on a background of one or more stationary colours.

The Derby Seen by Television

Daylight Transmission of Scenes at Epsom

WHEN at lunch on 3rd June I casually observed to my neighbour that I was going to see the Derby. He said that as there would be 15 miles of congested road to pass over on the way to Epsom, and it was already two o'clock, I could hardly get there by the time of the race. I assured him that nevertheless I had every intention of seeing it.

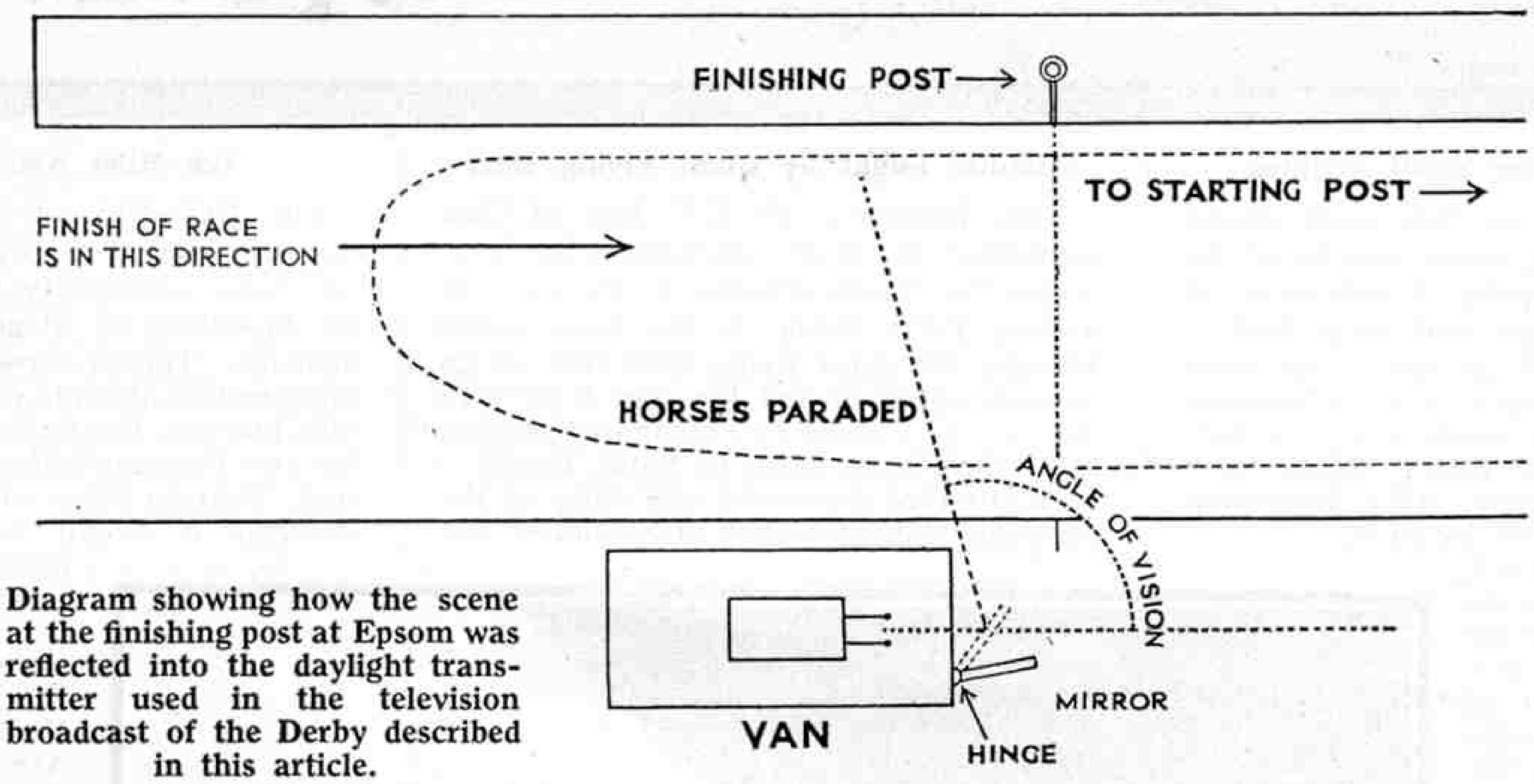


Diagram showing how the scene at the finishing post at Epsom was reflected into the daylight transmitter used in the television broadcast of the Derby described in this article.

I returned to the office and chanced to see him again at 2.30.

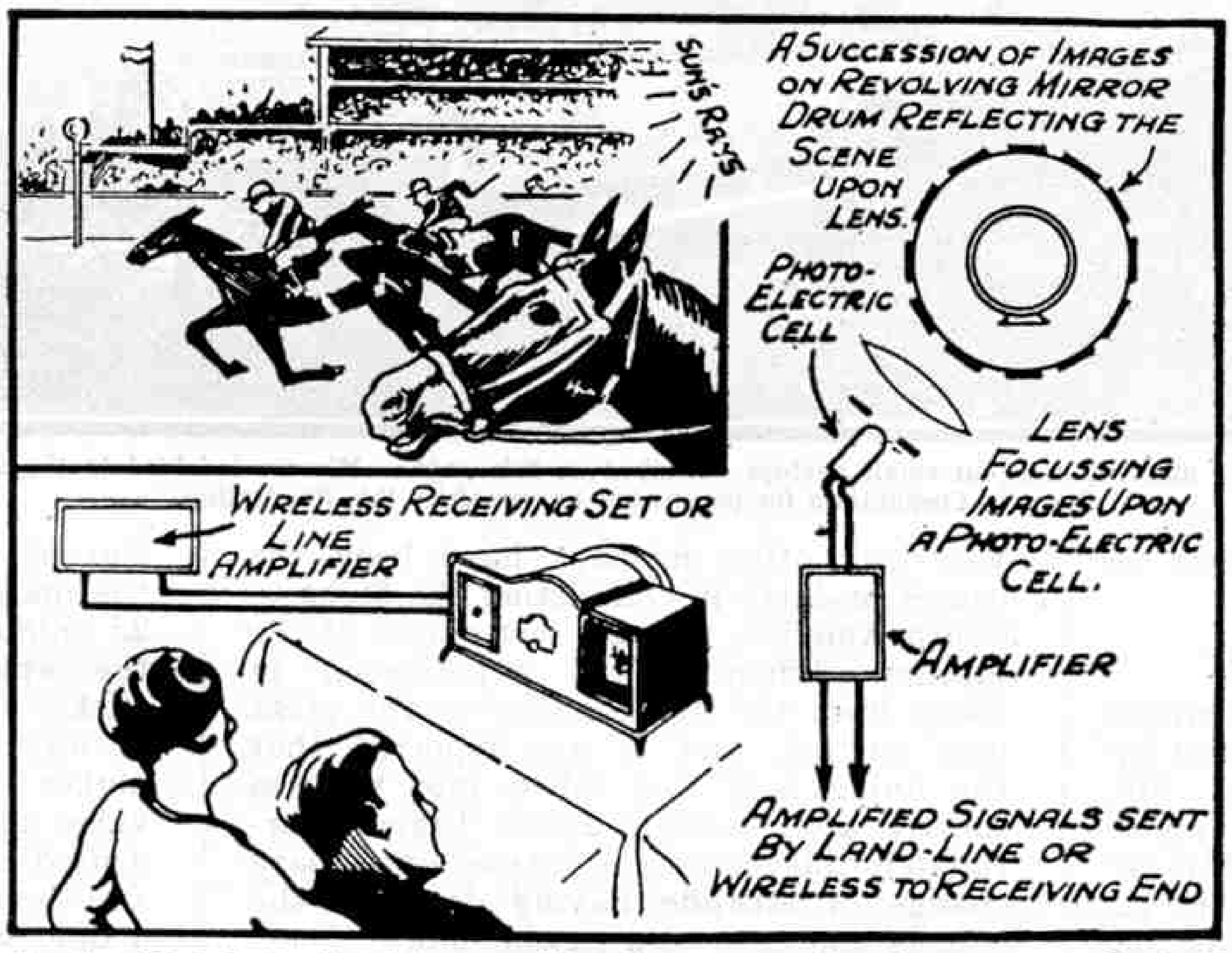
"I thought you intended to go to the Derby!" he exclaimed. "Have you changed your mind?"

"No," I replied, "I shall see it yet!"

The horses were due to parade at about ten minutes to three, and therefore at 2.45 I left the office in order that I should be in good time to see them. I walked down Long Acre—and turned into the offices of Baird Television Ltd.!

Several people were already there, excited at the result of a race just finished. I joined them, and found that on the screen of the Televisor we could see Epsom Racecourse very well. The Grand Stand and the car park were clearly visible. The weather was fine, and the crowd enormous; and the atmosphere of excitement was well conveyed.

We saw the horses parade before the Grand Stand and watched them cantering back to the starting point. We waited while the announcer described the scene we could see, and then suddenly came the announcement—"They are off!"


SUN'S RAYS
A Succession of Images on Revolving Mirror Drum Reflecting the Scene upon Lens.
Photo-Electric Cell
Lens Focussing Images upon a Photo-Electric Cell.
Wireless Receiving Set or Line Amplifier
Amplifier
Amplified Signals sent by Land-Line or Wireless to Receiving End

In the Baird daylight transmitter the successive images are flashed upon the photo-electric cell by the mirrors on the revolving drum.

The announcer described the scene as the horses went away round the course. They came near to the finishing post, and we in that room in Long Acre were as thrilled as those beside the track at Epsom, as we watched the neck and neck finish of Cameronian and Orpen. The effect was similar to that of a motion film, but we had the additional thrill of knowing that what we saw was actually happening at that moment.

The general principle of transmission used was that which is explained in the "*M.M.*" for July and August 1929. The daylight transmitter differs from the ordinary studio transmitter, however, in having a revolving drum carrying 30 mirrors in place of a scanning disc. This mirror drum reflects the scene in a succession of strips on to a photo-electric cell, the scene being focussed on to the cell by means of a lens. Each mirror is inclined at a slightly different angle from the preceding one and, as the drum revolves, each causes a strip of the picture to pass through the lens on to the photo-electric cell. The whole process is repeated 12½ times per second.

After amplification, the current was sent along a telephone line to the Baird Television Company's control room at Long Acre, and from there it passed through the B.B.C. channels to Brookman's Park, whence it was broadcast by the National transmitter, 261 metres. The running commentary was broadcast by the B.B.C. from the Regional transmitter, 365 metres.

This transmission was of course entirely experimental, but it proved that television could be taken out of the studio and applied to outdoor topical events, and also that the need for artificial light and the restrictions of the studio could be dispensed with. No such transmission had ever hitherto been attempted in any part of the world, and behind the successful experiment there was a romance of progress, and another page had been inserted in the annals of television. Even before I left the offices of the Company, telephone messages came from three distant owners of Baird "Televisors" saying that they had received the transmission very well.—G. RONALD JONES.

BLÉRIOT MAKES THE FIRST CROSS-CHANNEL FLIGHT JULY 1909.

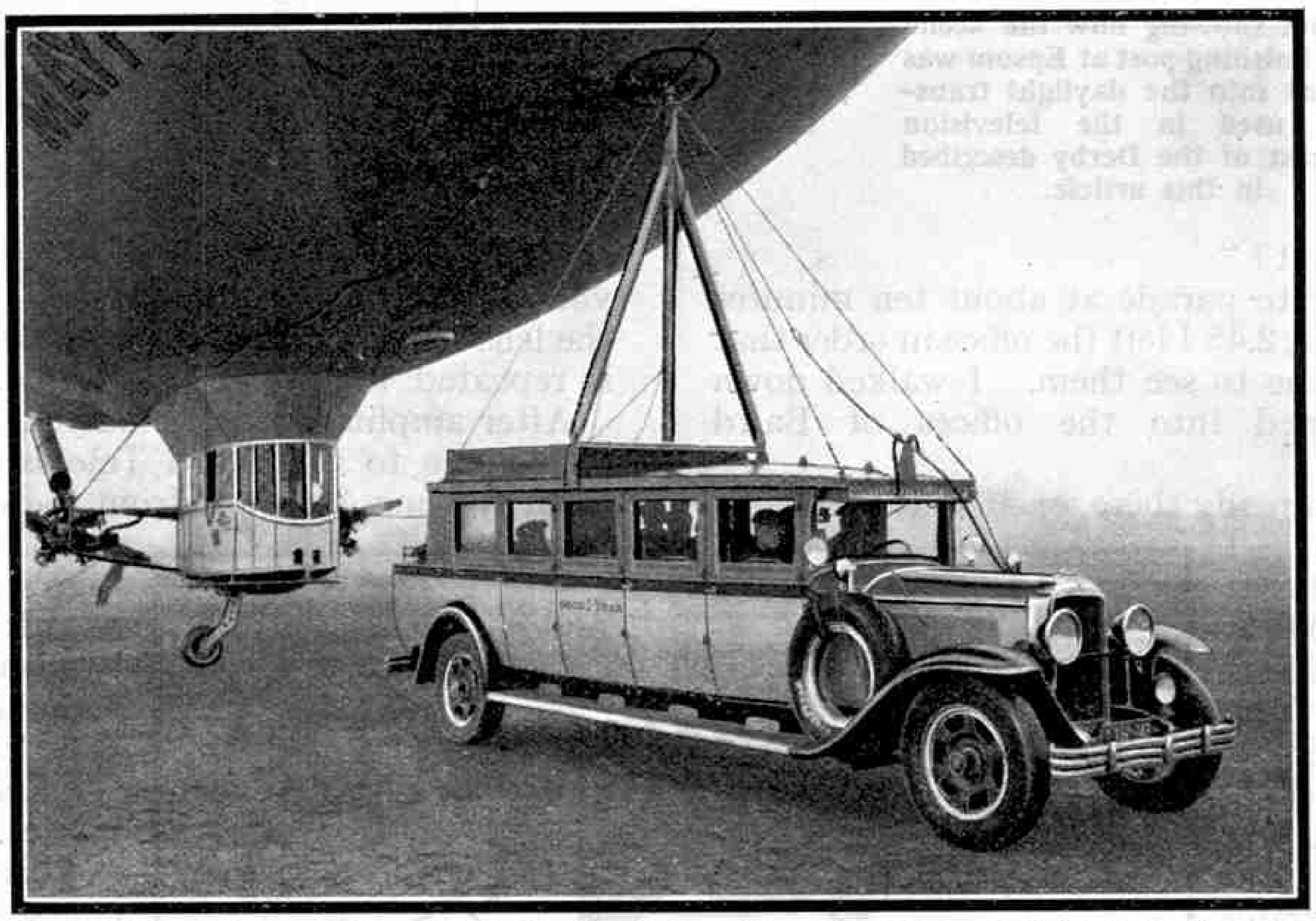
Air News of the Month

Portable Masts for Small Airships

The illustration on this page shows a portable mooring mast developed by the Goodyear Zeppelin Corporation of Akron, Ohio, for use with their fleet of "blimps" or small airships. The mast itself consists of a tripod that is adjustable to heights of from seven and ten feet. It is mounted on a motor vehicle used by the ground crew, this increasing the height of the mast by 7½ ft.

The airship is fastened to the mast by means of a special locking device built into a 16 in. disc in the forward part of the vessel. This slips into a groove at the top of the mast, where it is fastened securely. The mast has been thoroughly tested and on several occasions mooring has been effected in less than a minute.

It is claimed that a small airship could safely outride a 40 m.p.h. wind when fastened to a mobile mast of this kind. When buffeted by the wind the ship would merely pivot round the vehicle carrying the mast, and this also provides substantial anchorage, for without a load it weighs 3½ tons, and in working order its total weight is approximately five tons. When not in use the mast is folded and clamped down to the roof of the omnibus.



The portable mooring mast for small airships described on this page. We are indebted to the Goodyear Zeppelin Corporation for permission to reproduce this illustration.

The Channel Crossed in a Glider

The first crossing of the English Channel in a glider was made on 19th June last by Mr. Lissant Beardmore, a Canadian. Mr. Beardmore made the crossing from Lympne in a "Professor" sailplane. In this he was first towed to an altitude of 12,000 ft. behind an Avro 504K. He then cast off and glided out over the Channel to land at St. Inglevert about half an hour later.

The following day Herr Robert Kronfeld was towed to a height of 10,000 ft. above St. Inglevert and glided straight across the Channel, alighting at Swingate near Dover. On the return flight Herr Kronfeld reached Cape Griz Nez lighthouse 20 minutes after casting off.

Atlantic Flight by Giant Flying Boat

The Dornier *"Do.X"* has at last completed the flight commenced last year across the South Atlantic to Brazil. On leaving Porto Praia, in the Cape Verde Islands, the giant flying boat flew at an average speed of 182 km. per hour (113 m.p.h.) and landed at Fernando Noronha, afterwards being flown to Natal, Brazil.

A fire that destroyed one wing of the machine while at Lisbon in November last year and other mishaps have been the causes of delay in completing the flight to South America. In the last stages of the journey difficulty was experienced in rising from the water owing to the great load carried, and it was reported that the flying boat had fallen into the sea shortly after leaving Porto Praia. Fortunately this report was untrue, a necessary change of altitude having deceived the officers and crew of a passing ship.

It is interesting to note that a second flying boat of this type has been completed at Friedrichshafen, and has successfully made a number of test flights over Lake Constance. This has been built for the Royal Italian Air Force and is fitted with 12 Fiat engines, each developing 600 h.p. It will shortly be handed over to the Italian representatives.

Ten Miles Above the Earth

On 27th May of this year Professor Piccard, and Dr. Kipfer, two scientists of Swiss nationality, attained a height of 51,460 ft., or about ten miles, in a balloon. This is three miles higher than the greatest altitude previously reached in this manner, the former record being held by two German balloonists named Süring and Behrson who on 31st July, 1901, reached a height of 45,425 ft. It is interesting to compare Professor Piccard's record with that for aeroplanes. This is held by Lt. A. Soucek, of the United States Navy Air Arm, who reached an altitude of 43,155 ft. on 4th June, 1930.

Professor Piccard's successful attempt to reach a record height was undertaken with the object of investigating the upper atmosphere, and numerous instruments were employed in making a record of the conditions at the altitude reached. The adventurers were carried in an air-tight aluminium sphere slung beneath the balloon itself, which had a capacity of nearly 500,000 cu. ft. The ascent was made from Augsburg, Bavaria, this place being chosen because it is as far as is possible in Central Europe from stretches of open sea, and the maximum height was attained within 25 minutes of the start. Unfortunately the rapid ascent caused the gas valve to stick. Repairs were carried out, but it was decided not to attempt to get higher in view of the possibility of the valve again refusing to act. The balloon drifted southwestward to Lake Constance and then turned eastward. After pursuing a devious course above the mountains of the Tyrol, it came down on a glacier in the Oetz Valley.

* * * *

On the 17th June last Captain Frank Hawks made a flight to Rome and back, a distance of about 2,000 miles, in a day. Captain Hawks made the outward flight in 4 hours 39 minutes and returned in exactly five hours.

Catapult for Launching R.A.F. Aeroplanes

The Royal Aircraft Establishment have designed and built a catapult intended for the launching of multi-engined aeroplanes from land. It operates in a different manner from the type used on naval vessels and has been developed as a portable catapult for use where the taking off area is restricted. A demonstration of the apparatus was given at the R.A.F. Display in June.

The catapult consists of a revolving drum or capstan driven through gearing by a compressed air engine. A steel cable is wound round this capstan and fastened by quick release hooks to the underside of the fuselage of the aeroplane that is to be launched into the air. The cable is led forward to a 4 ft. pulley anchored to the ground at a distance of about 100 ft. in front of the aeroplane and is then taken back to the catapult drum, on which it is wound in the opposite direction to the other end of the cable. When the drum revolves the aeroplane is pulled at high speed toward the pulley, and at the end of the run an automatic device releases the cable hooks. The machine is thus shot into the air, leaving the ground at a speed of nearly 60 m.p.h. It immediately commences to fly, for its engines are previously run up to full power.

The complete action of catapulting a bomber into the air occupies about three seconds and the distance of 100 ft. is sufficient for a machine that requires a normal run of 300 yds. Two compressed air engines are employed to work the catapult, each developing 2,000 h.p. in the three seconds required to launch an aeroplane. Steam and cordite, a smokeless explosive, also may be used with these engines, which are capable of developing a total of 16,000 h.p. It is interesting to note that the catapults used for launching aircraft from the decks of naval vessels are operated by means of cordite.

New British Flying Boat Service

A company recently has been formed with the object of instituting and maintaining an air service between Guernsey, Jersey and England. The service will be operated by Saro "Flying Cloud" flying boats, of which two will be employed. One of these will be used for passenger traffic and the other for freight. It is thought that the freight machine will be in great demand during the early potato season, and that it will be largely used by flower growers, for it will enable their produce to be marketed much earlier than at present.

The new service will be the fourth to have been instituted over this route. The last one was operated three years ago by Imperial Airways, who employed Short "Calcutta" flying boats.

Australia to England in 10½ Days

Mr. C. W. A. Scott followed up the creation of the record of 9 days 4 hrs. for the flight from England to Australia, mentioned in the "*M.M.*" for June, by making the return flight also in record time. He completed the journey of 18,570 miles in 10 days 12 hrs. 25 mins., his actual flying time being 114 hrs. 30 mins. The previous best time was that of Air-Commodore Kingsford-Smith, who last year made the flight in 11 days.

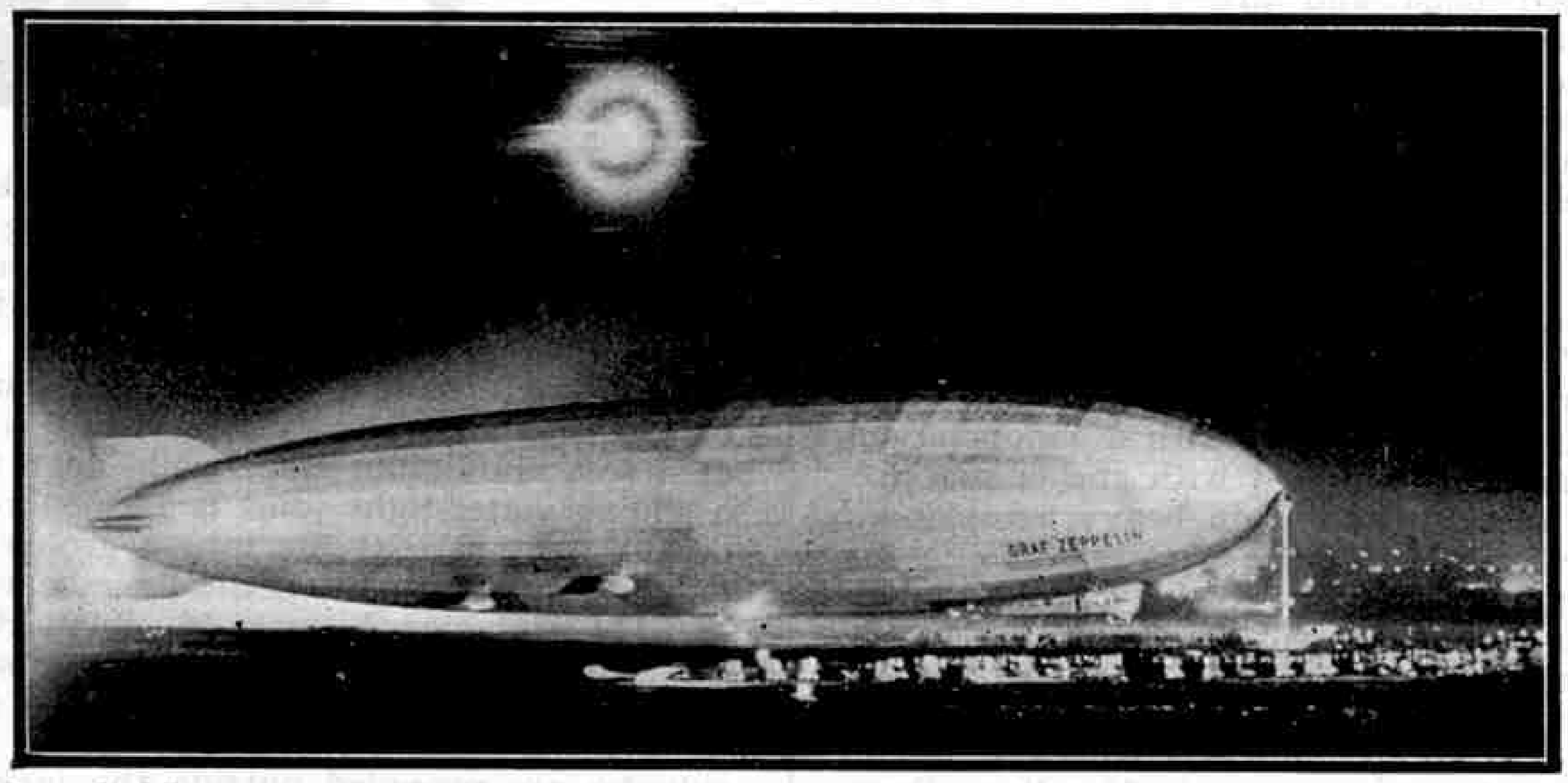
One of the Junkers low wing monoplane air liners used by the German Luft Hansa air line company arriving at Croydon Air Port.

Mr. Scott's flight was made in an all-metal "Gipsy Moth II" presented to him by Lord Wakefield at the conclusion of his record outward flight. Conditions during the return journey were unfavourable, storms and strong head winds being experienced on many sections, and the monsoons being encountered after leaving Rangoon. The longest stretch covered in one day was from Brindisi to Lympne, a distance of 1,310 miles.

British Long Range Monoplane

A new long range monoplane has been constructed by the Fairey Aviation Co. Ltd. This is similar to the machine in which Squadron Leader A. G. Jones-Williams and Flight-Lieut. N. H. Jenkins crashed in 1929 while attempting to create a long distance non-stop record. The new machine is to be used in a further effort of this kind. The first flight in it will probably be to Egypt and a non-stop flight to South Africa may be undertaken in October.

The pilots selected by the Air Ministry to make the attempt on the record are Squadron Leader O. R. Gayford, D.F.C. and Flight-Lieut. D. L. G. Bett.



A wonderful photograph taken at night of the "Graf Zeppelin" at Los Angeles during her aerial voyage round the world in August, 1929.

New Materials for Gas Cells of Airships

Interest in the U.S. Naval airships now being built by the Goodyear Zeppelin Corporation at Akron, Ohio, is increased by the announcement that new materials are to be used in the construction of their gas cells. Those of previous vessels have usually been made of goldbeater's skin. This is prepared by washing and drying certain parts of the intestines of cattle and has long been used by goldsmiths because it is thin and light, and yet tough enough to withstand repeated blows from a mallet. Thus sheets of gold placed between two layers of the skin may be readily beaten out to the thickness of fine leaf. Its qualities make goldbeater's skin very suitable for use in constructing the gas-containing cells of airships, but it would have been necessary to use the skins from 1,500,000 cattle to make those of one of the U.S. Naval vessels. This would have been very costly and efforts were therefore made to find substitutes.

One of the new materials employed consists of fabric impregnated with rubber and covered with paraffin. Cells made of this have been shown to be efficient in actual use, but gas escapes from them more readily than from cells constructed of goldbeater's skin. The remaining cells of the airship are to be made of what is called "gelatine-latex." It has not been revealed how this new material is prepared, but it is stated that cells made of it compare favourably with those of goldbeater's skin in their power of retaining gas.

New Type of Wind Direction Indicator

There can be no doubt that one of the most important necessities of an aerodrome is an efficient wind direction indicator. Most aerodromes are fitted with what is termed a wind stocking. This consists of a sleeve-shaped piece of fabric that is fastened to a mast on some part of the aerodrome and flutters in the slightest breeze.

At most aerodromes the wind stocking is set on a mast near the hangars, where the direction of the wind may not be the same as in the centre of the landing ground. A new type of wind direction indicator has therefore been developed by Dr. Ahrens, a young German engineer. It emits smoke plainly showing the direction of the wind and it is fitted in the centre of the landing circle.

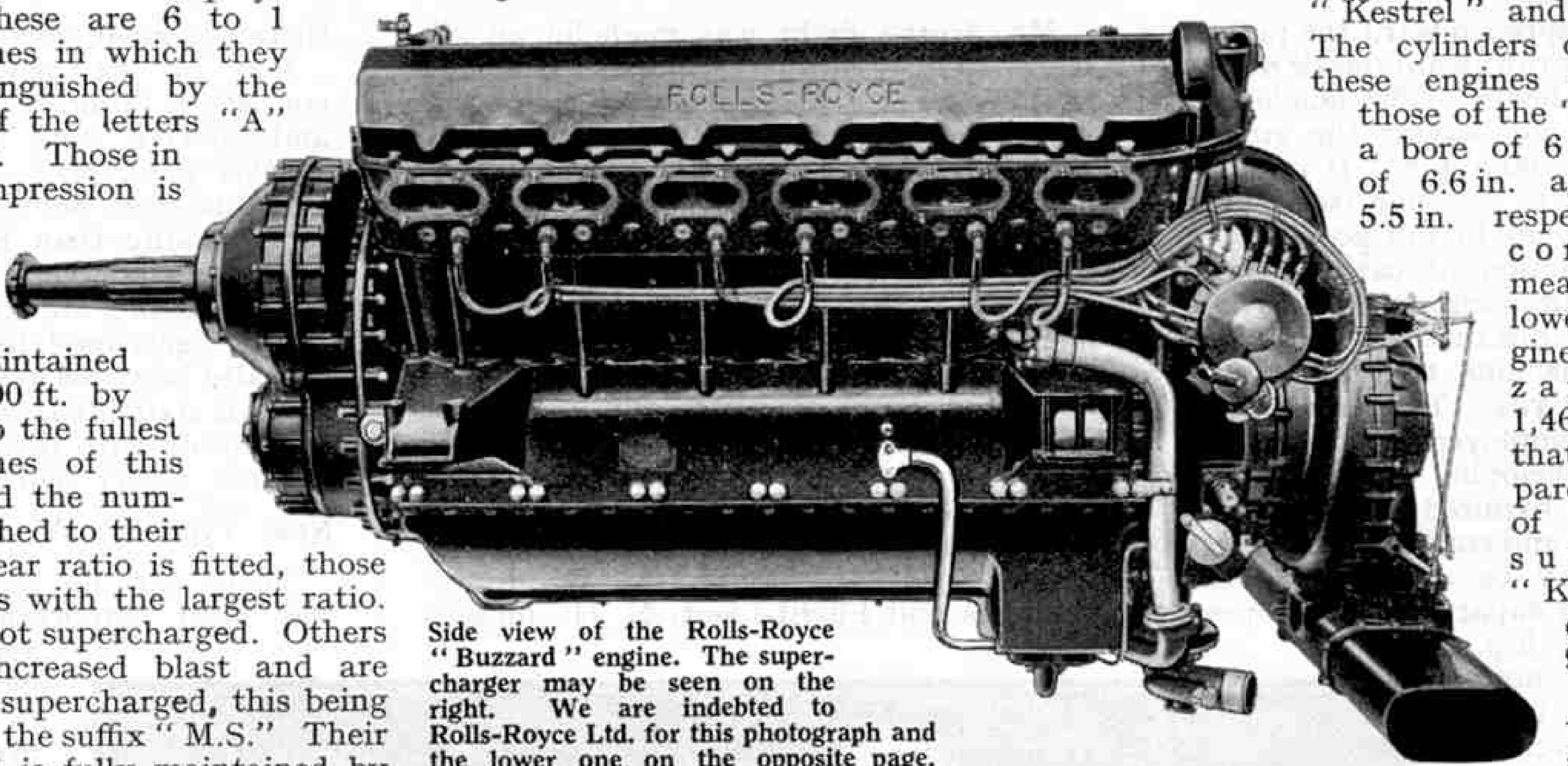
The apparatus consists of a triple burner that consumes a low grade oil, and is employed to heat a plate on which oil is dropped. Dense white smoke is formed and rises through a funnel. Hanworth Aerodrome is the first in this country to make use of the new type of wind direction indicator.

Famous Aero Engines

XV.—The Rolls-Royce "Kestrel" and "Buzzard"

In our issue for October, 1928, we described the Rolls-Royce "Condor III," a 12-cylinder water-cooled engine of 650 h.p. that was designed towards the end of the War. Since that time other interesting aero engines have been added to the range produced by Rolls-Royce Ltd. Among these are the "Kestrel" and "Buzzard" engines respectively, and to-day they and the "Condor III" are the only aero engines in regular production by the firm. The "Kestrel" and "Buzzard" also are 12-cylinder engines and are water-cooled. The cylinders of all three are mounted in two banks, but those of the new types are in blocks while the "Condor III" has separate cylinders. In both new engines the frontal area has been reduced as much as possible in order to keep down the air resistances of the fuselages of the aeroplanes in which they are fitted.

The "Kestrel" was formerly called the Rolls-Royce "F" engine and has a maximum power of 570 b.h.p. It is made in no less than twelve different models. These make use of the same main components but differ from each other in regard to compression ratio, gear ratio, and supercharging.



Side view of the Rolls-Royce "Buzzard" engine. The supercharger may be seen on the right. We are indebted to Rolls-Royce Ltd. for this photograph and the lower one on the opposite page.

Two compression ratios are employed in the engines of the "Kestrel" series. These are 6 to 1 and 7 to 1, the engines in which they are used being distinguished by the use in their names of the letters "A" and "B" respectively. Those in which the higher compression is used have a rated output of 480 h.p. This is developed at normal speeds at ground level and is maintained at heights up to 3,000 ft. by opening the throttle to the fullest extent. Three engines of this type are produced and the numbers I, II, or III attached to their names shows which gear ratio is fitted, those marked I having gears with the largest ratio.

Certain models are not supercharged. Others have a moderately increased blast and are said to be moderately supercharged, this being indicated by the use of the suffix "M.S." Their power at ground level is fully maintained by this means up to an altitude of 3,000 ft. The use of the letter "S" after its name denotes that an engine is fully supercharged and capable of maintaining its rated power at ground level at all heights up to 11,500 ft.

The "Buzzard" engine is rated at 825 b.h.p. It was previously known as the "H" type and was produced to meet the demand for a larger and more powerful engine than the "Kestrel." It is supplied in one form only and is fitted with a supercharger that may be used while machines equipped with the engine are on the ground. Thus it is specially useful on heavy aeroplanes, enabling them to rise easily from land or from water.

The wide range of the engines of the "Kestrel" type makes them suitable for service in many different kinds of aeroplanes. They are largely employed in military machines. Those fitted with them include the Short "Singapore II" among flying boats; such day bombing machines as the Fairey "Fox," Hawker "Hart" and "Avro "Antelope"; the twin-engined Handley Page "Hinaidi," a night bomber; and the Fairey "Firefly" and Hawker "Fury," which are single-seater interceptor fighters.

The use of an engine of the "Kestrel" type in the Hawker "Fury" is interesting, for this aeroplane is the world's fastest military machine. It is of very modern design and details of its performance have only recently been released by the Air Ministry. The standard "Fury" is fitted with the fully supercharged "Kestrel S" engine and has a speed of 207 m.p.h. at an altitude of 10,000 ft. The use of the supercharged engine gives it a speed of 214 m.p.h. when the machine is at a height of 13,000 ft., and it is capable of climbing to an altitude of 20,000 ft. in 9 mins. 40 secs. At that height its speed is 207 m.p.h.

The performance of the Hawker "Fury" is better than that of the experimental machine taking part in the interceptor trials last year, and it is well equipped for performing the duty that would be assigned to it in war conditions of intercepting enemy raiders shortly after crossing the coast line. Although its maximum speed is so high, the "Fury" is easy to handle and has a landing speed below the average of service aircraft. One squadron of the Royal Air Force—No. 43 (Fighter) Squadron—has been completely equipped with machines of this type and used them in a demonstration of formation flying at the R.A.F. display at Hendon on 27th June, 1931. Two other squadrons are to be equipped with the machine later in the year.

The Rolls-Royce "Buzzard" is employed in the Short "Singapore I," a twin-engined flying boat. The Short "Singapore II" already referred to is a development of this machine and four "Kestrel" engines are fitted to it in order to increase the power available, the total output of four engines of this class being greater than that of two "Buzzard" engines. It is interesting to note that the four-engined "Singapore II" is claimed to be the fastest flying boat in the world.

There is very little difference in construction between the "Kestrel" and the "Buzzard." The cylinders of the second of these engines are larger than those of the "Kestrel," having a bore of 6 in. and a stroke of 6.6 in. against 5 in. and 5.5 in. respectively for the corresponding measurements of the lower powered engines. The "Buzzard" weighs 1,460 lb., a figure that may be compared with the weight of the moderately supercharged "Kestrel III. M.S." engine, which is 900 lb.

In both engines the 12 cylinders are set in two blocks inclined at an angle of 60° to each other. The cylinder blocks are aluminium castings, and the cylinder heads are cast in one piece with the walls forming the water jackets. The separate aluminium bronze valve seats are screwed into the heads and cast-iron valve heads are fitted.

The liners, or cylinder linings, are of high carbon steel, and are of simple design. The flanged joint between the upper end of the liner and the cylinder head is made gastight by means of a soft aluminium ring, while near the lower end of the liner a sliding water-tight joint is formed by means of a rubber ring of oval section that fits into a groove in the liner. Below this joint a flange formed on the liner bears on the crankcase. Long bolts hold the whole assembly in position. These bolts are also fitted between each cylinder bore, passing through aluminium tubes swaged into the cylinder block in order to prevent water leakage. In the "Buzzard" engine two additional bolts per cylinder are provided outside the jacket.

In order to reduce to a minimum the length of the cylinder block, and thus of the whole engine, the steel linings of the cylinders are not separated from each other by aluminium walls. Thus the assembly of this cylinder block is an extremely simple matter, while the water jacket can readily be cleaned out at each overhaul, for when the liners are withdrawn, its interior surfaces are exposed. The exterior surfaces of the cylinder barrels are plated in order to make them immune from the corrosive effects of unsuitable water. The plating can, if desired, be renewed during overhaul. This valuable new feature of Rolls-Royce engines has appreciably reduced maintenance cost.

Each cylinder is fitted with two inlet and two outlet exhaust valves. The valves are machined from chromium silicon steel.

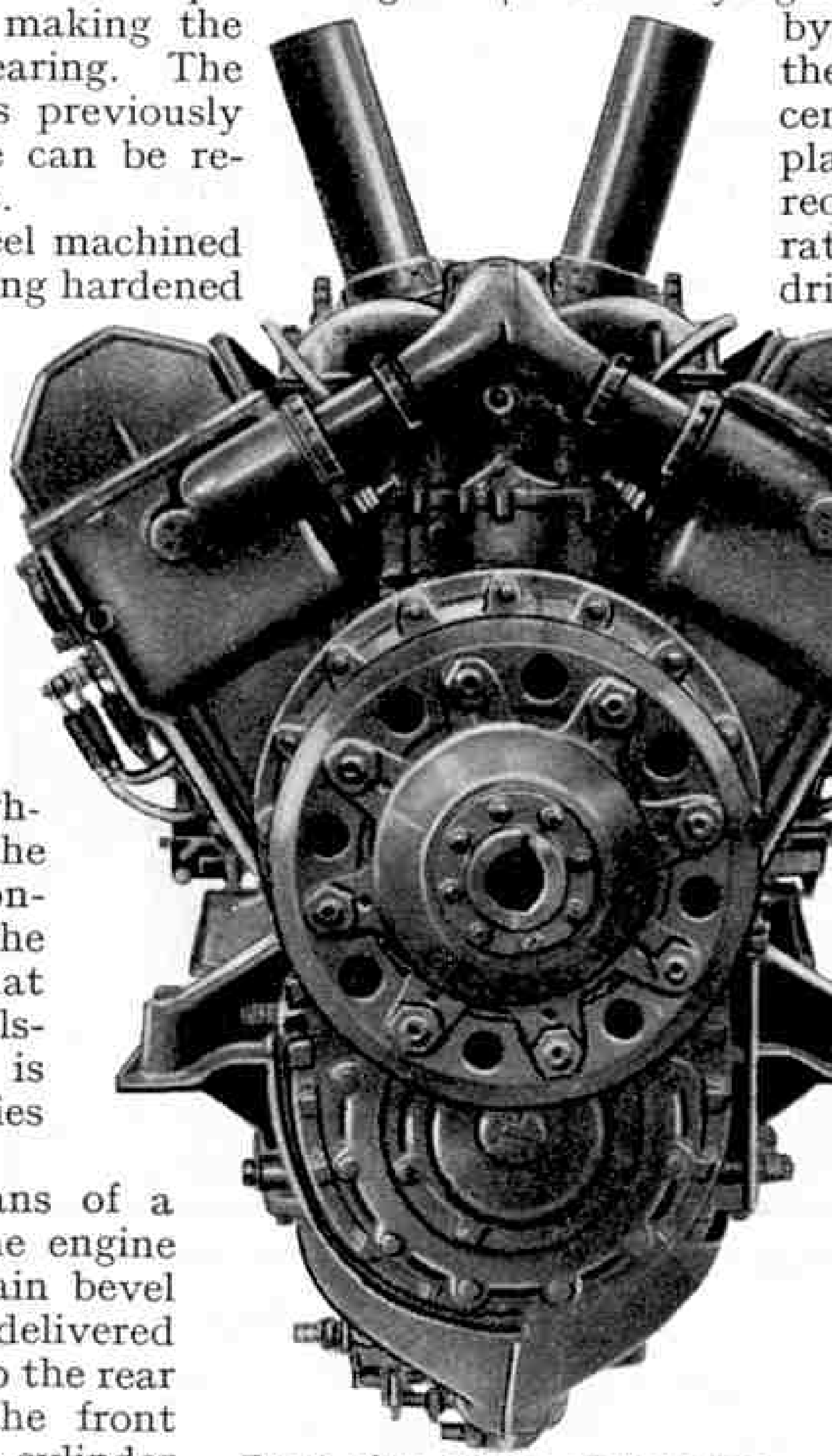
They are operated by an overhead camshaft, a separate rocker being provided for each valve. The valve gear has been specially designed in order to secure a minimum overall height of the cylinder block, and thus to reduce the total head resistance of the engine as much as possible.

The pistons are made from forged aluminium alloy and are machined all over. Three compression rings and one oil scraper ring are fitted and stops are provided to prevent the rings rotating. The hollow gudgeon pins are made of silicon manganese and are steel hardened and ground. They are of the full floating type, axial movement being limited by circlip rings at the ends.

The "Kestrel"-engined Hawker "Fury" single-seater interceptor machine. This photograph is reproduced by permission of the H. G. Hawker Engineering Co. Ltd.

Forked-type connecting rods are employed. The rods are of "H" section made from forgings of 3½ per cent. nickel steel machined all over. The big end of the forked rod consists of a mild steel block split longitudinally and lined with white metal internally, a white metal bearing surface also being provided over the outside of the central portion on which the big end of the blade rod works.

The crankshaft is machined from nickel chrome steel, and runs in seven main bearings fitted into the upper half of the crankcase. Thus the lower half of the crankcase may be removed without interfering with the bearings. The split bearing shells are of mild steel lined with white metal. They are held in place by forged duralumin caps and bolts fitted into parallel guides in the crankcase. In order to prevent any possibility of the cap working in these guides, and also to increase the torsional rigidity of the crankcase, bolts are passed right through the crankcase and the cap, thus making the unit almost equivalent of a solid unsplit bearing. The great advantage of this system is that, as previously mentioned, the lower half of the crankcase can be removed without interfering with the bearings.



Front view of the Rolls-Royce "Kestrel" engine.

The camshafts are of 5 per cent. nickel steel machined from the solid, the actual bearing surfaces being hardened and ground. The rockers, which are of the same material, are machined all over. They have hardened and ground cam follower faces and adjustable tappets are also fitted. The camshaft bearings and wearing surfaces are lubricated from the low-pressure oil system.

Power is transmitted from the crankshaft to the airscrew through single spur reduction gearing. This form of gearing has been chosen because it has the advantage of bringing the airscrew shaft roughly into the centre of the cross section of the engine, thereby assisting the aircraft constructor in obtaining good streamlining. The airscrew hub attachment is similar to that which has been used with success by Rolls-Royce Ltd. for many years. The hub is centralised upon cones at its extremities and driven by splines towards the rear end.

The cooling water is circulated by means of a centrifugal pump situated at the rear of the engine and driven by a vertical shaft from the main bevel wheel of the camshaft drive. Water is delivered from the pump by two separate connections to the rear end of each cylinder jacket, leaving at the front ends by horizontal pipes running between the cylinder blocks to the rear of the engine. Oil is supplied by pumps of the usual gear type. These are driven by splined gearing from the vertical shaft that operates the water pump.

The engines are fitted with hand-starting gear. This is of the worm-and-wheel type and it incorporates a multiple clutch that is designed to slip in the event of a backfire. The worm wheel is mounted on the sleeve carrying the main bevel wheel for the auxiliary drive. Below this worm wheel is a splined shaft on which the worm is mounted, the engine being turned by means of a crank handle at either end of the splined shaft. When the engine fires, the worm will be driven along the shaft clear of the worm wheel. The worm is restored from the free to the working position by means of a small hand-operated lever. In order to make starting easier a mixture of air and petrol may be injected into the induction system. This operation may be carried out from the pilot's cockpit.

In modern aircraft, especially those of high performance type, it is practically impossible to obtain a satisfactory gravity-fed petrol system. A petrol pump to feed the carburetters is therefore a necessity. The type fitted to the Rolls-Royce engine is driven by means of spur-gearing from a small cross-shaft that in turn is worm driven off the vertical shaft of the water pump. The same shaft provides the drive for the generator of the Constantinesco gun synchronising gear.

"Kestrel" engines of types A and B are fitted with two Rolls-Royce duplex carburetters mounted between the cylinder blocks. The supercharger employed in certain models is of the centrifugal type. It is driven from the crankshaft through the medium of the flexible shaft that acts as a spring drive to the camshaft and auxiliaries.

The impellor fan of the supercharger is made of duralumin and is fitted with radial blades that are driven through speed-multiplying planetary gear. This is frictionally driven by means of "slippers" held in engagement with the inside of the gear arms by light springs. The slippers are driven from the crankshaft by a pinion, and as their speed of rotation increases, the radial pressure of the springs also is increased by centrifugal force and consequently the power that the planets can transmit increases considerably. The power required to drive the impellor increases at a similar rate and because of this the gear can be arranged to drive the impellor with a predetermined margin of power above that causing slip, the margin being constant throughout the working range of speed. The object of the special friction drive is to protect the gear against damage caused by sudden acceleration or deceleration of the crankshaft.

The speed of the impellor on the "Kestrel M.S." engine is 15,525 r.p.m., while on an engine fitted with a full supercharger the speed of the impellor is 22,500 r.p.m. at normal engine speed.

A twin-choke tube carburetter of Rolls-Royce design and manufacture is provided. It is incorporated with the supercharger casing at the rear of the engine, and is in such a position that it does not increase the frontal area. The jets are of the submerged type delivering into the air stream through diffusers. Two pilot jets and small auxiliary diffusers are provided for starting purposes and small throttle running, and the points at which they discharge their mixture into the main mixture stream are adjustable, relative to one edge of each throttle blade, in order to ensure a smooth change over as the throttles are opened.

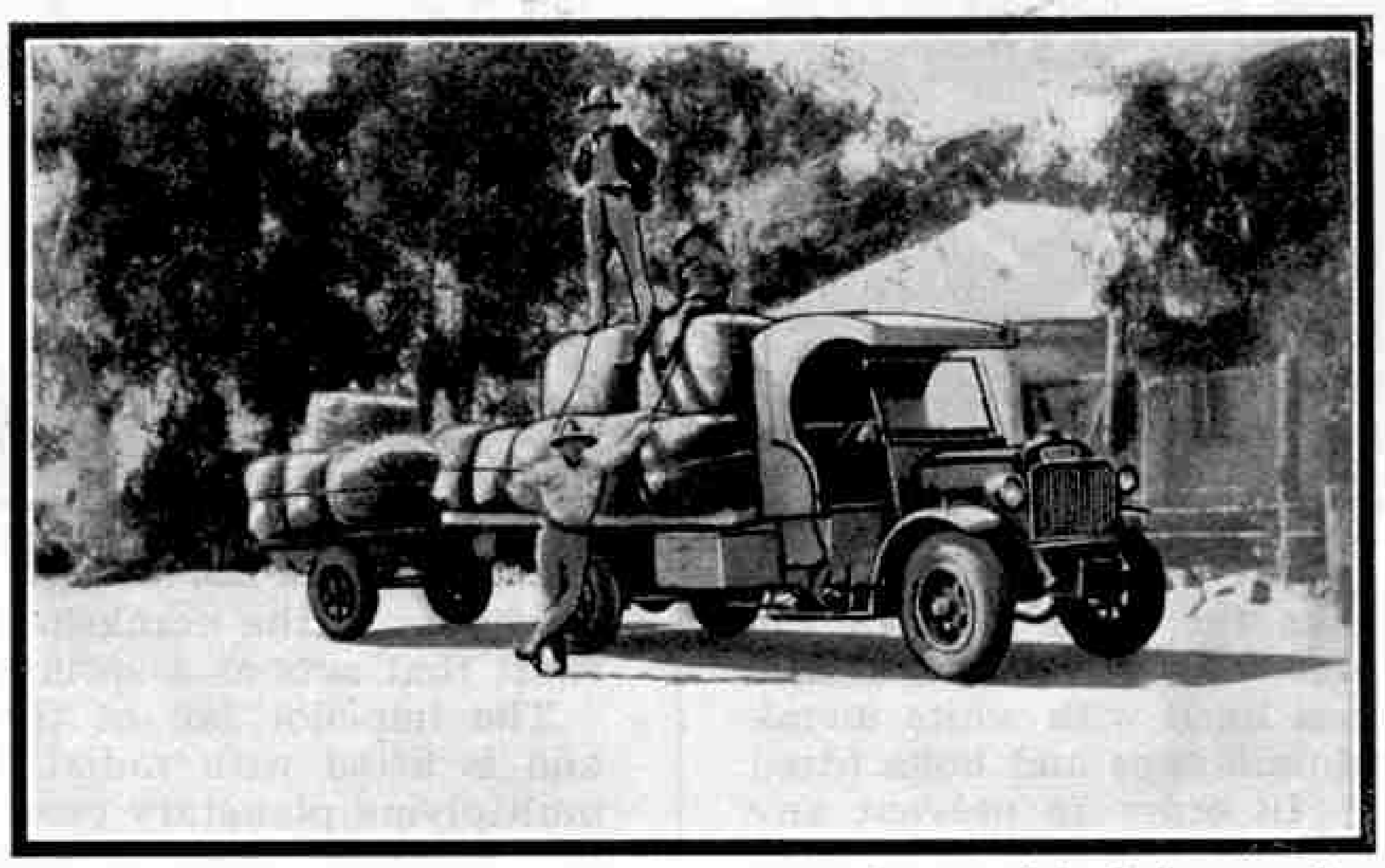
Control of the strength of the mixture to suit different altitudes is effected by hand by means of a conical valve arranged in the fuel passage from the float chamber to each jet. The levers for this purpose, and also for controlling the throttle are connected to a transverse shaft on the rear of the engine. The engine is so arranged that there is no necessity for an additional control for the ignition to be fitted, the setting of the magnetos being operated by the throttle. The ignition timing is fully advanced when the throttle is in the central position.

From Our Readers

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

On a Wool Truck in North West Australia

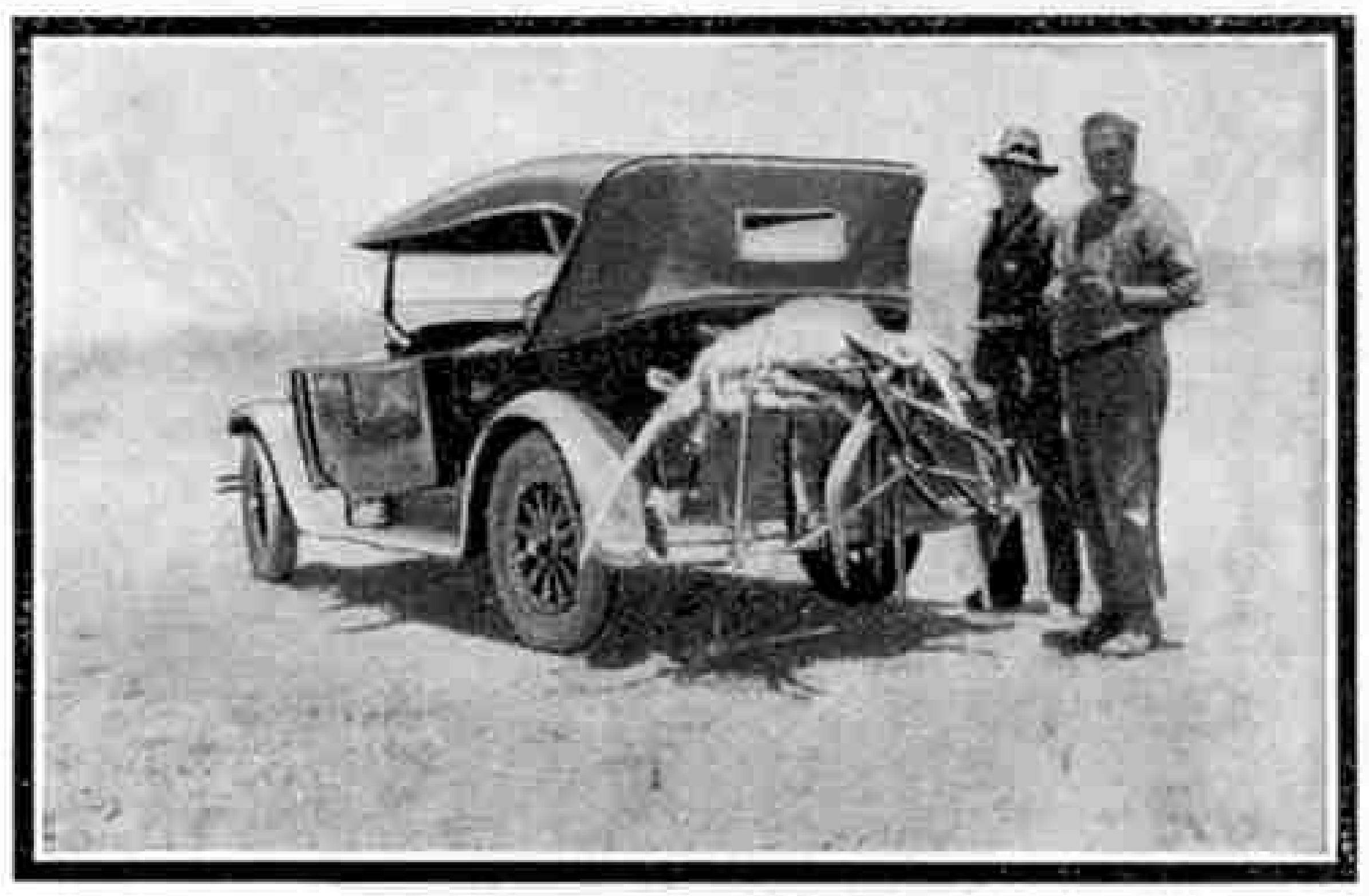
Recently I enjoyed a splendid motor run through an interesting and little known district in Western Australia. I was staying at a station, or sheep ranch, situated nearly 200 miles inland from Carnarvon, a seaport about 500 miles north of Freemantle, and the purpose of the run was to convey 19 bales of wool to the coast. Twelve of these were carried on the motor truck in which I travelled and seven on a trailer.


A wool truck ready for the long trip to Carnarvon from an inland sheep station in West Australia.

The trip was a rough one because recent heavy rains had damaged the tracks. The country over which we first passed was covered with dense thickets of mulga and snakewood, which derives its name from the fantastic manner in which its branches are twisted. Several large creeks had to be forded, and after that the track led into the heights of the Peel Range.

The ascent of the range was slow, but as compensation for our lack of speed we saw many "bigida" or rock kangaroos, these strange creatures appearing to be attracted rather than frightened by the drone of the engine. At other places on the run emus could be seen scurrying away in alarm at our approach, very often accompanied by a dozen chicks scampering along beside them, these usually following the male bird.

After passing through a small town built at the junction of two important railways we continued across a sandy plain in which more kangaroos and an occasional wild turkey could be seen. A lonely stretch of sandhill country followed, and there the truck, which was already overloaded, had difficulty in surmounting the hills. In the places where the sand is deepest the track and the sides of the cutting through which it passes are bound with brushwood in order to prevent driven sand from covering the road completely.


Returning from a kangaroo hunt in West Australia.

We continued until 2.30 a.m., and as we had been on the road for 22 hours, during which we had covered 172 miles, we then stopped for the night. Early next morning we continued our trip. The first sign of our approach to Carnarvon was the homestead of a settler, where a few sleepy camels were wakened by the noise of the engine, and the port was reached at 7.30 a.m. after an arduous but enjoyable run of 27 hours.

J. R. C. TRELEAVEN (Katanning, West Australia).

A Tour of a Maize By-Product Factory

Maize is one of the principal crops of South Africa, and during a visit to a Johannesburg factory in which the grain is treated, I was astonished to find what a great variety of products it yields. As the maize arrives, it is freed from dust and dirt by what are in effect giant vacuum cleaners and is steeped in water in order to cause it to swell. It is then washed into vats where revolving paddles skim off the maize germ. This floats because of the high proportion of oil contained in it, and therefore is easily separated from the heavier portion of the grain. The oil is squeezed out of it by giant presses and after refining is suitable for cooking purposes. Maize oil of lower grade is employed in the manufacture of soap and glycerine.

The seed leaves, or maize meats, which form the greater part of the grain, are ground with water and passed over stretched silk in order to separate the starch from the gluten. The starch is again filtered, broken up and dried, thus giving an industrial form of this product. In order to convert it into cornflour it is further purified by washing and filtering. Alcohol also is made from it by heating under pressure with dilute hydrochloric acid, and fermenting the glucose thus formed. Maize alcohol is a useful fuel for internal combustion engines, possessing many advantages over the more expensive petrol. It is used for other industrial purposes, and is denatured before being released for commercial use.

No part of the maize is wasted. Even the cobs are digested with hot water in order to extract gums from them, or they are distilled to produce a paint remover, while the stalks are converted into cardboard and insulating material.

In designing the factory that I visited, care has been taken to reduce unnecessary handling of the grain. Conveyors are largely used to move the various raw materials and products from one department to another in order to effect this. Maize arriving at the mill is carried on a travelling belt to the cob-removing machine, and the grain set free in this is then fed on to conveyors that lead to the cleaning mill, the cobs being automatically discharged into hopper wagons.

R. E. BERNSTEIN (Johannesburg).

From Southampton to Winnipeg

One of the most enjoyable experiences of my life was my journey from Southampton to Winnipeg, where my present home is situated. The voyage across the Atlantic Ocean was made in the Canadian Pacific steamship *"Empress of Australia,"* a vessel with a gross tonnage of 21,833. During the voyage I was never at a loss for employment of an interesting character, for I was able to play tennis and deck quoits, and to take parts in games tournaments of various kinds. One of the engineers very kindly invited me to look at the engines, and under his guidance I descended several flights of steps into the depths of the vessel, where I inspected not only the great turbine engines and the tanks in which is stored the oil required for raising steam, but also the shafts of the three screws of the vessel.

When Quebec was reached I was very sorry to leave the ship but looked forward with interest to my journey across Canada to Winnipeg. On the way I visited Toronto, where I spent a week, and naturally I took advantage of the opportunity of seeing Niagara Falls. At the time of my visit more water than usual was flowing over the brink and the Falls were a most impressive sight. The roar was deafening and spray was flung out in heavy showers that, when seen from below, gave rise to the formation of a magnificent coloured arch resembling a rainbow.

Our reader, C. A. Fisher, and his brother on board the C.P.R. liner "Empress of Australia."

Finally I boarded the C.P.R. Vancouver express, which was headed by a "Pacific" locomotive of the 2335 class described in the "Famous Trains" series in the *"M.M."* for May, 1928. This is a huge engine with a tractive effort of 44,965 lb., and to me it was strange to see the whole of the great driving wheels, 6 ft. 3 in. in diameter, for these are not partially hidden by splashers, as are those of British locomotives. The journey along the northern shore of Lake Superior was specially interesting, for the track passes through some of the wildest country in Canada. The engineers who constructed the line had great difficulty in finding a firm path across muskeg or swampy country they encountered in certain sections, and at one point of the track it was necessary to blast a gallery out of the hard rock in order to enable the line to pass along the shore of the lake.

On the route to Winnipeg itself I saw a number of Indian encampments. Almost the first thing I saw in the city was the *"Countess of Dufferin,"* the earliest locomotive to be employed on the western division of the C.P.R. This historic engine reached Winnipeg by rail and barge in 1883, and now stands on special rails in the approach to Winnipeg Station.

C. A. Fisher (Winnipeg).

Three Hundred Miles in the Guard's Van

I have recently enjoyed a privilege which I think many Meccano boys would be glad to have, for I have travelled from Bridlington to Barrow-in-Furness and back in the guard's van. It was a most instructive experience, for I did not fail to ask the various guards I travelled with as many questions as I could, and gained many hints that have been useful in running my Hornby Train.

When I arrived at the station to begin my outward journey the guard was examining the train to make sure that the coaches were properly coupled up, the brake and heating pipes connected, the indicator discs of the alarm apparatus at the ends of the carriages in the correct position and everything generally in order for the journey. He had also noted the number, class and weight of each vehicle and communicated these details to the driver, in addition to testing the working of the automatic brake.

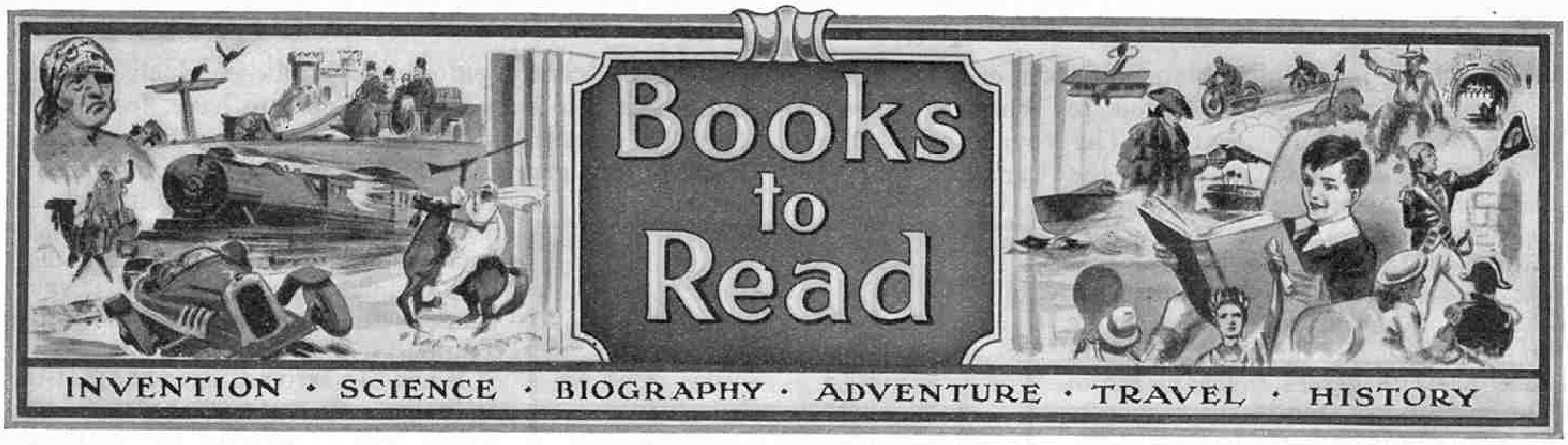
During the journey I noticed that the guard kept his eye on the brake gauge and also on the indicator that showed him the available steam pressure from the engine. He explained the working of the emergency brake to me and told me that occasionally the drivers of trains in which he had travelled had forgotten to pull up at a station and that he had had to bring them back. He also explained some details of the time book he kept. I observed that after leaving every station he made an entry in this book, and he told me that he was entering the times of arrival and departure. If we were late he had to explain how the loss of time occurred, stating whether it was due to the locomotive, or to delay at stations caused by the heavy nature of the traffic.

Kenneth Gee, Bridlington, whose interesting description of a railway journey in the guard's van appears on this page.

One of the guards with whom I travelled said that once in every five weeks he had to travel on a night train consisting of a locomotive and one vehicle only. This was one of a large number of mail and parcel trains that run regularly during the night hours, and make some of our busiest junctions even busier at midnight than they are at midday!

I think my greatest pleasure during my two long journeys came from the unusual view of the line that I obtained from the windows of the van. I could see both sides of the line from them and I gained a much better impression of the country through which the train passed than if I had only been able to see the two sections visible from an ordinary compartment. It is particularly interesting to look back when entering a tunnel, and to watch the entrance grow smaller as the train rushes onward.

Kenneth E. Gee (Bridlington).



Books to Read

INVENTION · SCIENCE · BIOGRAPHY · ADVENTURE · TRAVEL · HISTORY

On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/– should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"The Wonder Book of Inventions"

By A. M. Low. (Ward Lock & Co. 6/–)

This book, one of the well-known "Wonder Book" Series, is written by Professor A. M. Low, D.Sc., Chairman of the Technical Committee of the Institute of Patentees, who should therefore be well qualified to write on this subject.

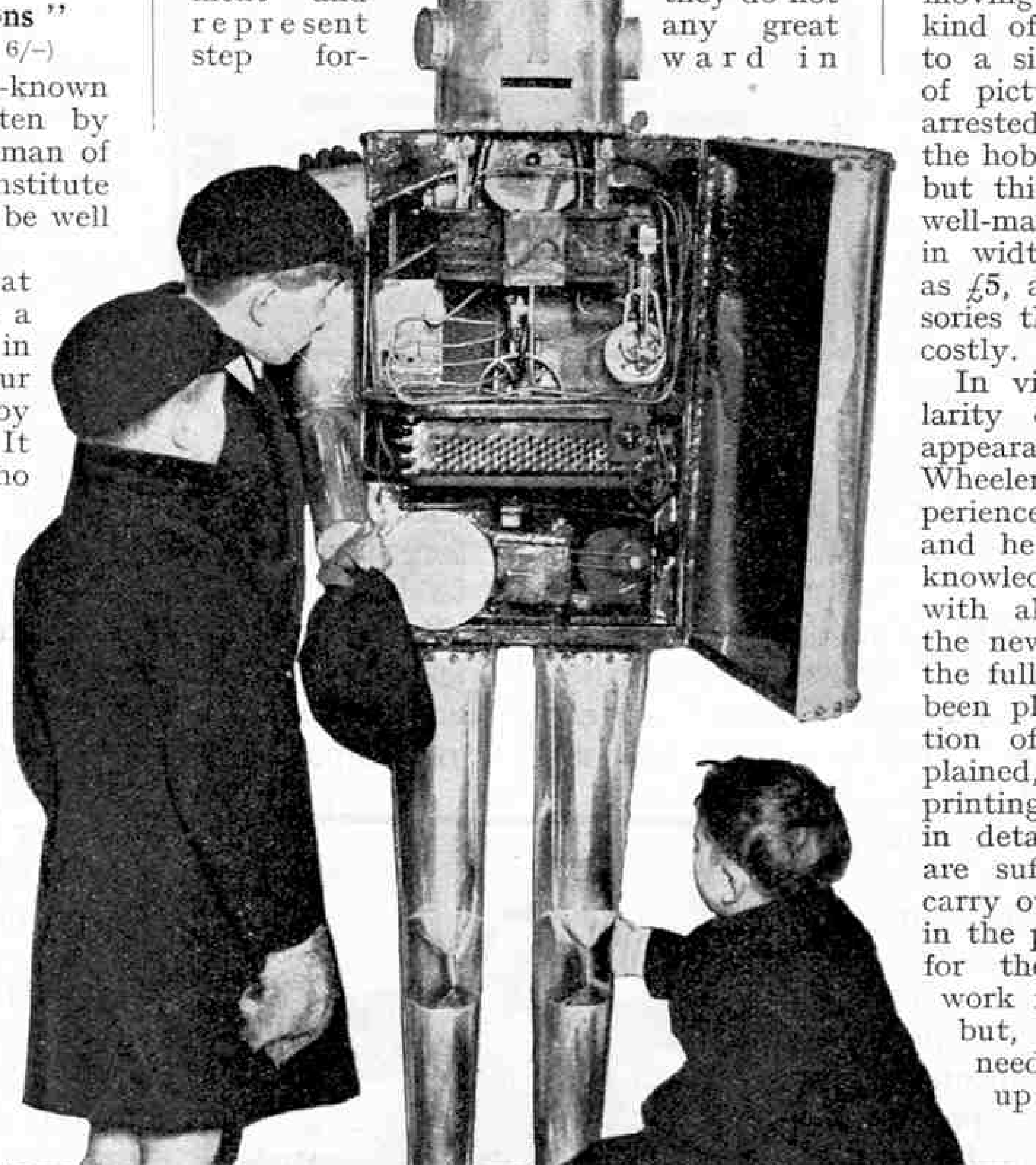
In these days we all realise that although kings and statesmen play a great part in the newspapers and in our history books, in actual fact our daily lives are influenced far more by people of whom we seldom hear. It is, in a sense, the inventors who "make the world go round," and their wonderful work governs our actions at every turn. This has been even more particularly true during the last ten or fifteen years, when one invention after another has come along so quickly as to almost give us a kind of mental and mechanical indigestion!

In this fascinating volume, Professor Low deals with the many recent inventions that are transforming our everyday lives, and a new world of wonder is opened to its readers. Among the inventions dealt with are such marvels as Talking Pictures; Rocket Cars and 'Planes; Wonders of Television and Wireless; X-rays and radio activity; Robots or Mechanical Men; the Post Office Tube Railway, and dozens of others equally ingenious and amazing.

Professor Low asks us if we ever thought how pleasant it would be if we had mechanical servants to do all our hard tasks for us. We should "just have to push in a plug and for the rest of the day your mechanical housemaid would dress you, clean your shoes, set the table, cook, wait on you, and in fact, perform the 10,000 tasks which no one likes doing very much . . . fantastic as this picture may seem, it is a possibility of the future."

A true mechanical man has not yet been invented. A number of machines have been made that perform the same tasks as a man would do, but the day when we shall have mechanical servants such as the author visualises, must be a long way off. Some very ingenious machines have been made that look like mechanical men, including one that will raise its arm at the word of command and even walk by itself. In Meccano, also, a mechanical man has been built (Model No. 6.3). Up to now, however, these Robots have been made only for amusement and they do not represent any great step forward in invention. They may capture our imagination, but they are of no real use and the outer shape has nothing to do with the internal working or machinery, as Professor Low points out in one of the chapters of his fascinating book.

The book is wonderfully well illustrated with over 300 photographs of the greatest interest, and twelve colour plates that have been specially painted by well-known artists.



Seeing "how it works"—investigating the mechanism of a Robot. (From "The Wonder Book of Inventions" reviewed on this page).

"Amateur Cinematography"

By Capt. O. Wheeler, F.R.P.S.
(Sir Isaac Pitman & Sons Ltd. 6/– net)

Amateur cinematography is a new hobby that promises to become almost as popular as ordinary photography. Its advantages over the latter scarcely need to be pointed out, for clearly a moving representation of almost any kind of subject is much to be preferred to a single picture, or even to a series of pictures, in which all movement is arrested. It might be thought that the hobby would necessarily be expensive, but this is not the case. A thoroughly well-made camera to use films 10 mm. in width may be obtained for as little as £5, and the projector and other accessories that are required are by no means costly.

In view of the rapidly-growing popularity of amateur cinematography the appearance of this book is timely. Captain Wheeler has had a long and wide experience of every phase of photography, and he has the ability to pass on his knowledge clearly and simply. He deals with all branches of amateur work in the new hobby and describes practically the full range of ciné-cameras that have been placed on the market. The operation of these instruments is fully explained, and the processes of developing, printing and reversing are also dealt with in detail for the benefit of those who are sufficiently enthusiastic to wish to carry out the whole of the work involved in the production of complete films ready for the projector. This part of the work is admittedly of a tedious nature but, as the author points out, this need not deter anyone from taking up the hobby, for the purchaser of a Kodak film is now entitled to have it developed and finished for him in the laboratories of the manufacturer.

The technical sections of the book are followed by interesting and practical advice on the use that may be made of a cinematograph camera in producing family records, in the making of travel and holiday pictures, and in nature photography. A useful chapter tells of the filming of short amateur plays, and valuable hints are given in regard to the preparation of films of all types for actual projection.

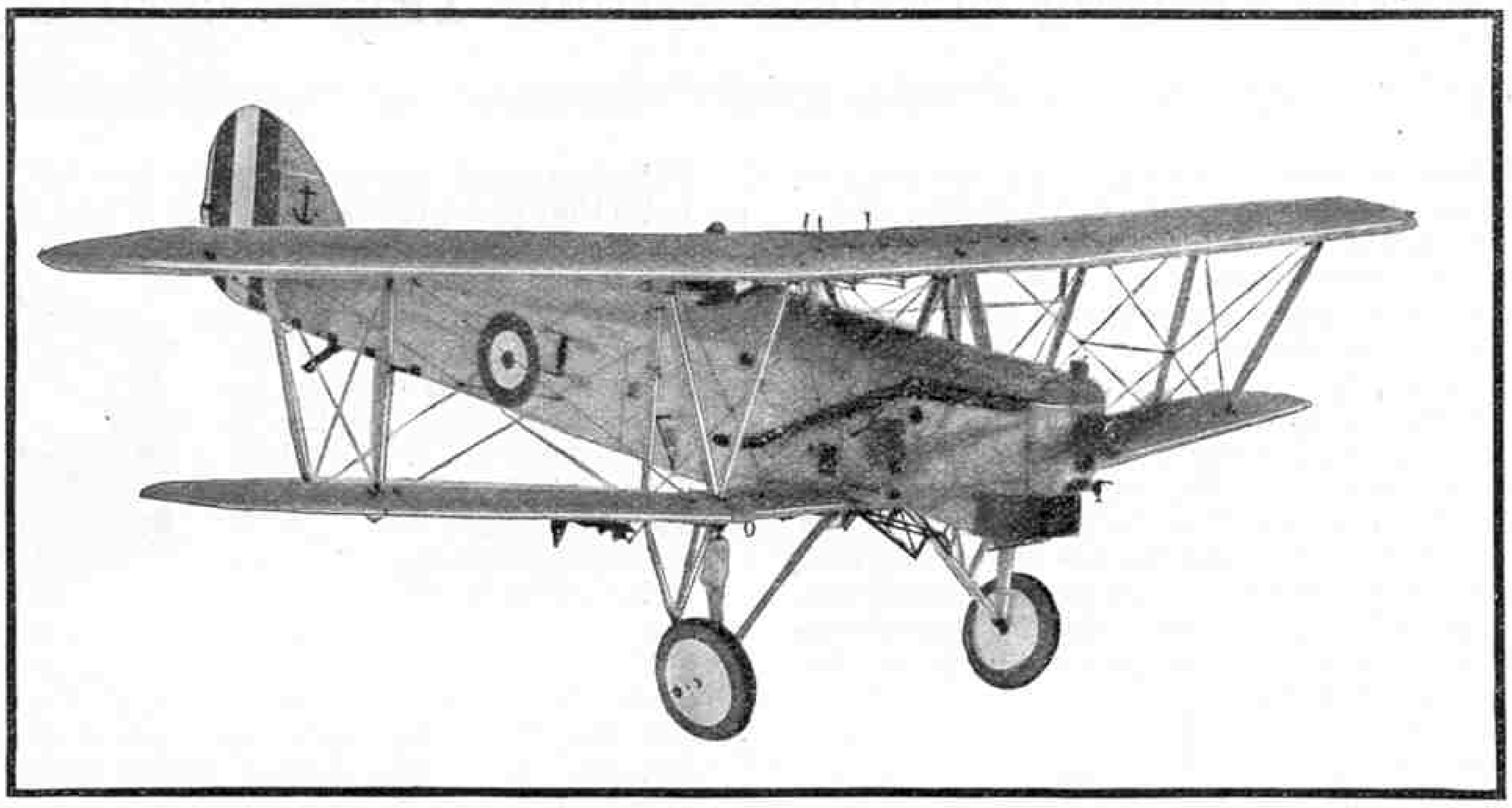
The book is well illustrated, and can be thoroughly recommended as a valuable guide to a fascinating hobby. The author's comments on the respective merits of the standard 35 mm. film, and the 16 mm. and 10 mm. sub-standard film, are worth careful consideration by any reader who contemplates taking up cinematography.

"Aviation of To-day"

By J. L. Nayler and E. Ower. (Warne. 15/-)

This volume, which is uniform with those in the well-known "Wayside and Woodland" series, comes up to the expectations of those acquainted with the previous volumes in the series.

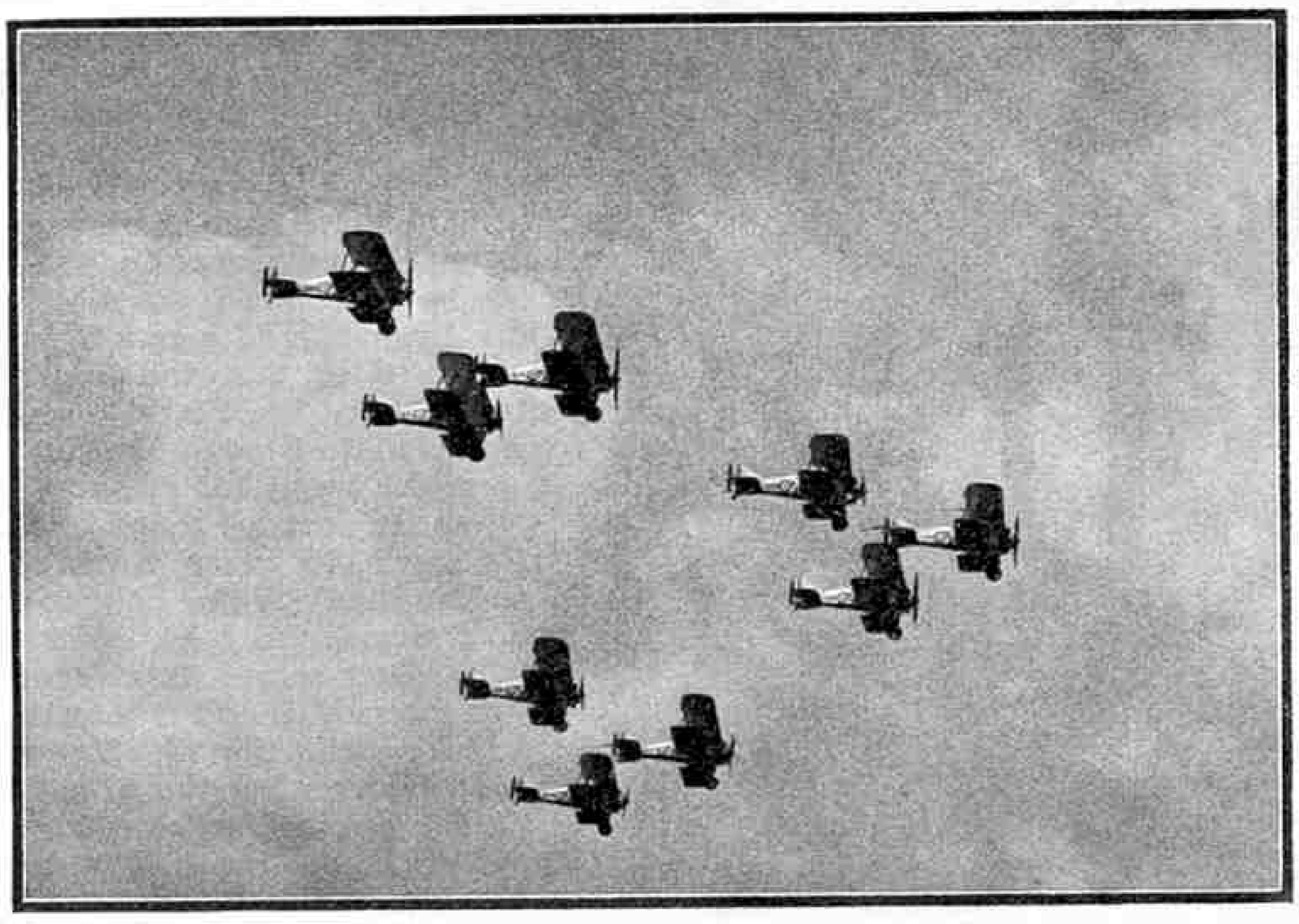
Although the book does not pretend to be a history of aviation, the outstanding historical events are included because it is intended to be a broad survey of the whole subject. The authors' aim has been to present, in as simple a manner as possible, the principles on which human flight has been built up, and then to show how these principles have been applied in the design and operation of aircraft. Finally, to describe some of the many remarkable achievements that mark the progress of the art of flying, together with information as to the use of the art at the present day and its possibilities in the future.



Hawker "Horsley" Bomber showing bomb racks under lower wing. (From "Aviation of To-day." See below).

This extensive programme has been well followed out and those of our readers who wish to have a complete guide to aviation in all its forms and aspects will find this book a mine of information.

First, we learn about the flight of animals. Oh! yes some heavier than air animals do fly—the flying squirrel, for one, uses the properties of an inclined surface and moves through the air as does an aeroplane; the spider is an expert parachutist; the lemus are "good gliders" and make long glides from one tree to another; and then there are flying fish, and, of course, birds and insects. This is followed by chapters on the atmosphere; the development of the balloon, the airship and the aeroplane; aeronautical science; navigation of aircraft; aeroplane design; seaplanes and autogiros; and others equally interesting. The book is illustrated with no less than 48 colour plates, 113 photographic reproductions, and numerous sectional charts, diagrams and maps, all of which help to make clear the letterpress and detailed descriptions. The value of the book is enhanced by an excellent index.



Gloster "Gamecocks" flying in squadron formation. (From "Aviation of To-day" reviewed on this page).

"Essays of a Locomotive Man"

By E. A. Phillipson, M.I.C.E., G.I.M.E., A.M.I.Loco. E.
(Locomotive Publishing Co. Ltd. 3/6 net)

This interesting book consists of a series of thirty-five essays on a variety of locomotive matters, based largely, the author tells us, on discussions in which he has taken part. In view of the attention that is now being given to the question of railway electrification, two essays are of particular interest, one dealing with the future policy of the locomotive department, and the other with the rivals of the steam locomotive. The author believes that the locomotive of the future will work at extremely high pressures and be equipped with a totally enclosed high-speed, single-acting, multi-cylindered engine, comparable on a large scale with the conventional internal combustion engine. He regards the extended use of large freight engines in this country as of doubtful advantage, except for mineral and other traffics running in fairly regular and heavy streams. The load of a smaller but comparatively fast-running engine is made up quicker, and this, in conjunction with a reasonably intensive service, tends to expedite the delivery of general merchandise.

Special subjects such as lubrication and injectors are treated in an interesting manner, together with more general topics such as works policy and shops layout. Some insight into a most fascinating part of the work of the locomotive running man is given in a discussion of comparative trials, and the views afforded on the topical subject of standardisation, as applied to locomotives, will be eagerly followed by all railway enthusiasts. Prospective candidates for the locomotive engineering profession are not forgotten, and altogether the book is full of useful material. Its value would have been increased considerably by the provision of an index.

"Swimming For All"

By R. C. Venner. (G. Bell & Sons Ltd. 3/6 net)

This practical book on swimming differs from all others we have seen, in the amount of attention given to preliminary training on land. The author considers that the management of the breath is to the beginner the most difficult and the most important part of the art of swimming, and that breathing and limb movements are more easily and better learned on land than in the water. He therefore commences with a series of simple preliminary breathing exercises to be carried out in a wash basin or bath, the object of these being to accustom the beginner to breathe in and out as he will have to do in actual swimming.

The next step is to practise, first on land and then in shallow water, the various limb movements, so that when actual swimming commences these movements will be largely automatic, enabling attention to be concentrated mainly on other matters. Subsequently the author describes the different swimming strokes, with special land drill for each one, and a good deal of practical general advice.

There can be little doubt that a beginner who follows the remarkably simple system described in this book will have a far better chance of becoming a good swimmer than one who makes his first attempts in the water. It is interesting to note that the author denounces, not only as unnecessary but actually harmful, all contrivances, such as water wings, for supporting the body during early efforts to swim. These appliances do not remove the fear of sinking, but perpetuate it by preventing the beginner from discovering how readily the water will support him.

"Short Stories in Science"

By J. G. Crowther. (Routledge. 5/-)

Here is a readable account of recent scientific developments, with something about interesting discoveries in the realms of Astronomy, Physics, and Engineering. Everything is of interest that comes to Mr. Crowther's pen and he writes as easily about liquid stars and planetary mysteries as he does about frozen meat!

Such a book will appeal to all who are interested in the work of our scientists, and who wish to be kept up to date with their investigations without having to wade through the voluminous technical descriptions that are so necessary when a new discovery is announced for the first time. Nowadays each science seems to have a language of its own, which is perplexing to the amateur. We regret that the book has no illustrations, while the inclusion of even a short index would have been helpful.

New Meccano Models

Universal Radial Drilling Machine—Mouse Trap—Naval Gun—Crane

WHEN reading of the enormous castings that are used in the construction of modern engineering structures, many Meccano boys no doubt will have wondered how these great masses of metal are drilled ready for assembly. The engineering shops where the castings are prepared are equipped with large gantry cranes by means of which the parts can be transported for final assembly, but it is in many cases impossible to arrange a casting in a fixed drill press owing to its size and shape.

It then becomes necessary to reverse the normal procedure and take the drilling equipment to the casting. Compressed air drills are sometimes employed for this work, but by far the most interesting equipment from the mechanical point of view, is the portable radial type drilling machines that are now employed extensively in large engineering works for drilling operations where the fixed type drill cannot be employed. One of the most interesting examples of this type of machine is the "Asquith" portable universal drill manufactured by W. Asquith (1920) Ltd., of Halifax, and the Meccano model universal machine that we describe this month follows the design of an "Asquith" drill.

Among the other new Meccano examples shown this month, owners of small outfits will be pleased to see that we have included three further very simple models. These represent respectively a mouse trap, a naval gun, and a travelling crane.

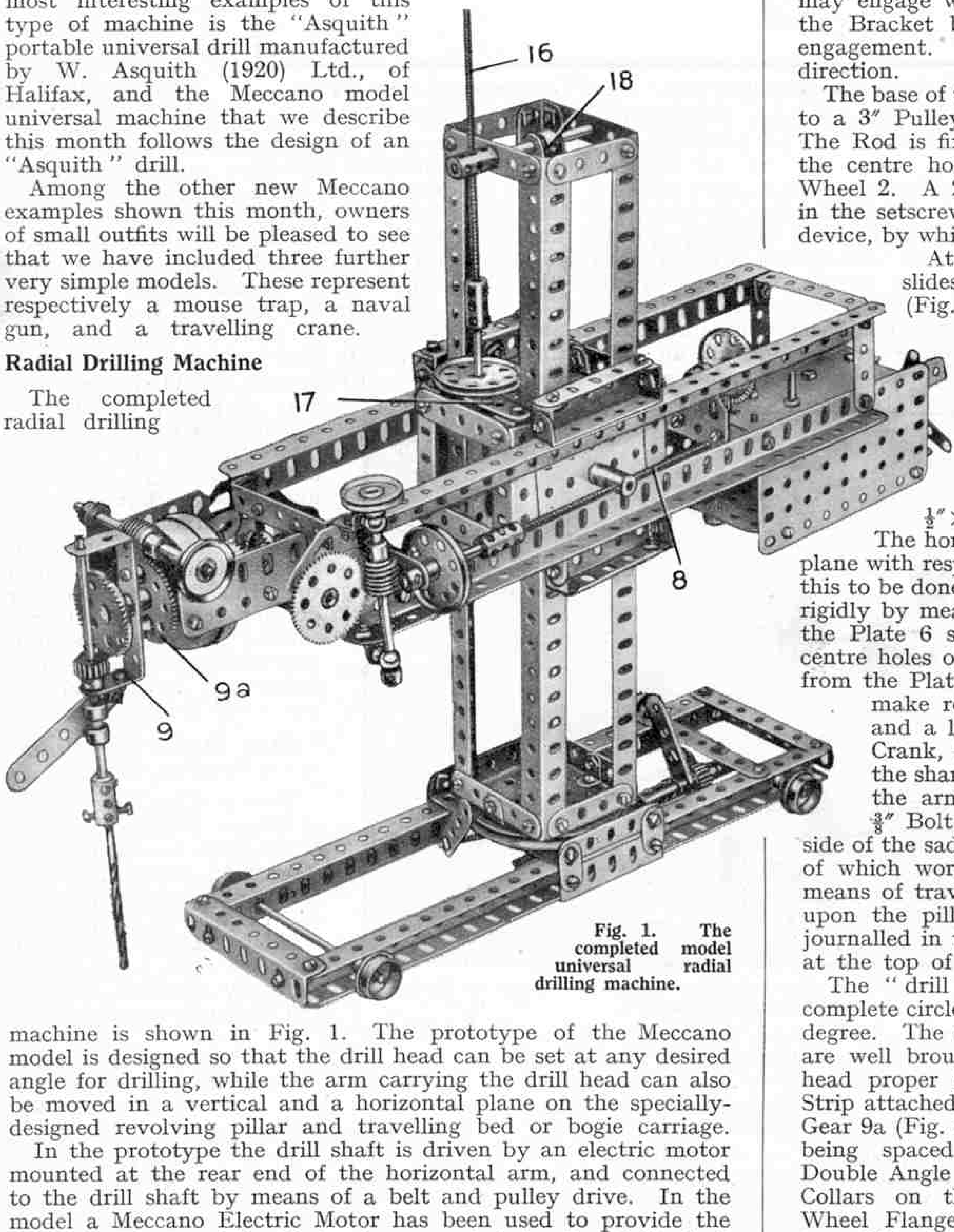


Fig. 1. The completed model universal radial drilling machine.

Radial Drilling Machine

The completed radial drilling machine is shown in Fig. 1. The prototype of the Meccano model is designed so that the drill head can be set at any desired angle for drilling, while the arm carrying the drill head can also be moved in a vertical and a horizontal plane on the specially-designed revolving pillar and travelling bed or bogie carriage.

In the prototype the drill shaft is driven by an electric motor mounted at the rear end of the horizontal arm, and connected to the drill shaft by means of a belt and pulley drive. In the model a Meccano Electric Motor has been used to provide the necessary power. The Motor is connected to the drill shaft through a double Contrate and Pinion shaft drive.

The main features of the travelling bed or bogie frame of the model will be seen in Fig. 4. The saddle 1, that carries the pillar and slides on the bed, consists of two 3½″×2½″ Flanged Plates secured together face to face by the bolts that serve to fasten a Bush Wheel 2. The travelling bed is retained in place on the side members of the bed by 2½″ Angle Girders. The traversing of the saddle along the bed is effected by a Screwed Rod, which is journalled in a Handrail Support 13 and works in a Threaded Boss 14. It is actuated by means of a reversible ratchet 3. This consists essentially of a 2″ Strip, mounted freely on the Rod, with a ½″×½″ Angle Bracket attached pivotally to it so that the Bracket may engage with the teeth of a ½″ Pinion secured to the Rod, the Bracket being weighted with a Collar to ensure constant engagement. The ratchet device works equally well in either direction.

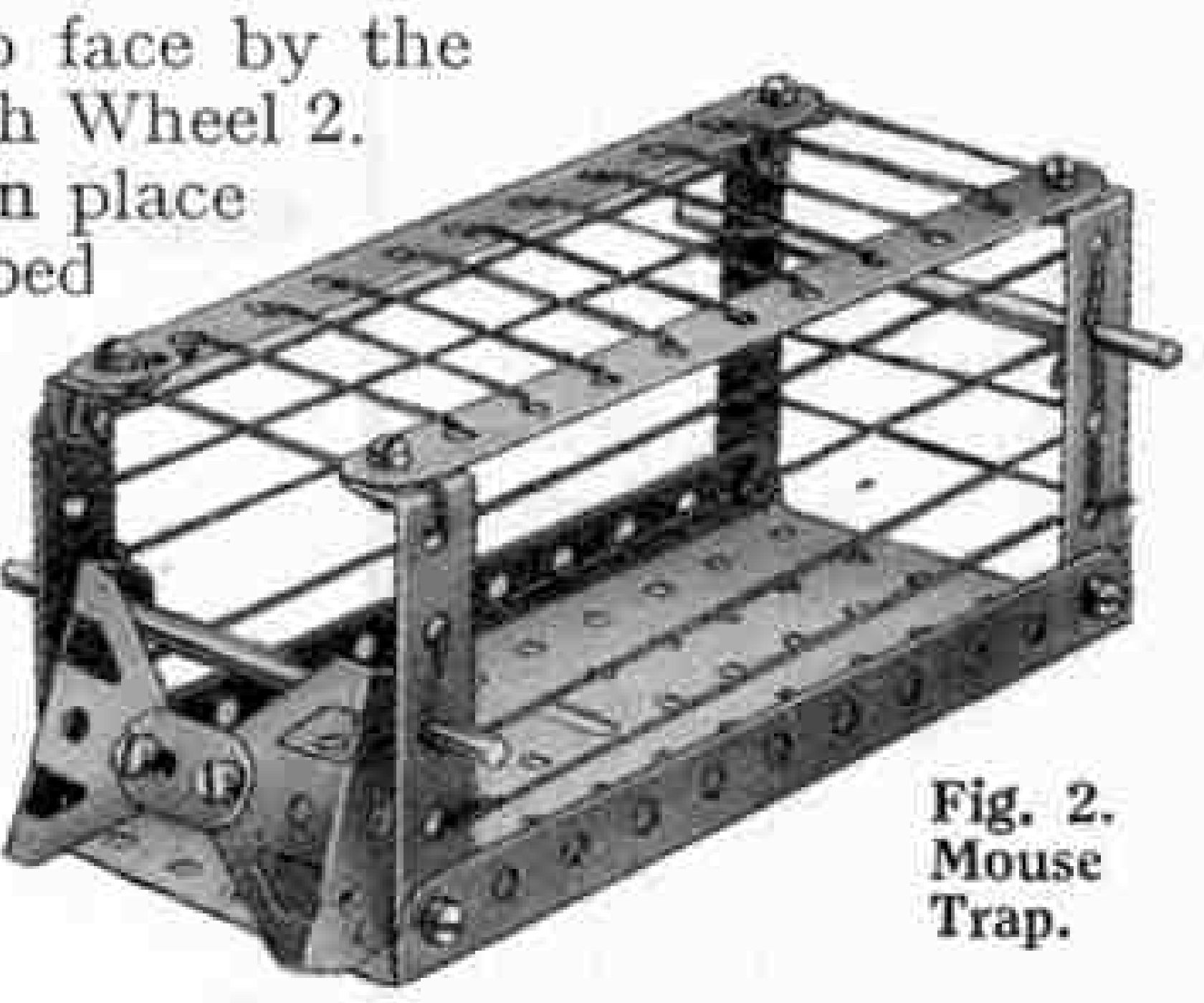


Fig. 2. Mouse Trap.

The base of the pillar is secured rigidly by ½″×½″ Angle Brackets to a 3″ Pulley, which is attached to the saddle by a 1½″ Rod. The Rod is fixed in the boss of the Pulley, and passes through the centre holes of the Flanged Plates and through the Bush Wheel 2. A 2″ Screwed Rod, secured to a 2″ Strip, is inserted in the setscrew hole of the Bush Wheel and serves as a locking device, by which the pillar may be locked in any desired position.

Attention should next be paid to the saddle that slides upon the pillar and carries the horizontal arm (Fig. 6). The part fitting the pillar consists of two 3½″×2½″ Flanged Plates 4, connected together by 2½″ Strips. Double Brackets 5, bolted to the flanges of the Plates, press against the Girders of the pillar, and in order that they shall do so efficiently they are packed out with Washers. Each of the slides carrying the arm consists of a 3½″×2½″ Flanged Plate 6, to the flanges of which 2½″×½″ Double Angle Strips are attached by ½″×½″ Angle Brackets.

The horizontal arm is capable of being rotated in a vertical plane with respect to the saddle, the pivoting mechanism enabling this to be done. It is assembled as follows: A ¾″ Bolt is secured rigidly by means of a nut to a 3½″ Strip 7, which is attached to the Plate 6 so that the shank of the bolt passes through the centre holes of the Plates 4 and 6. The Strip 7 is spaced away from the Plate 6 by a Washer on each of its retaining bolts, to make room for the nut on the ¾″ Bolt. A Bush Wheel and a locking handle, the latter consisting of a Threaded Crank, to which is bolted a 2½″ Strip, are then placed on the shank of the Bolt, so that by turning the locking handle the arm may be locked and prevented from tilting. A ⅜″ Bolt serves as a pivot for the two Plates on the other side of the saddle, and is inserted in a Coupling in the tapped hole of which works the 4½″ Screwed Rod 8 (Fig. 1) that forms a means of traversing the arm. Vertical movement of the saddle upon the pillar is effected by the Screwed Rod 16, which is journalled in the Strip 17 on the saddle and works in a Coupling at the top of the Pillar.

The "drill head" 9 is capable of being turned through a complete circle, and also tilted in a vertical sense to a considerable degree. The constructional details of this portion of the model are well brought out in Fig. 6. The drill head proper consists of a 2½″×1″ Double Strip attached by two ¾″ Bolts to a 57-teeth Gear 9a (Fig. 1), and a Boiler End, the Gear being spaced equidistantly between the Double Angle Strip and the Boiler End by Collars on the Bolts. A Wheel Flange 10, attached to a 2½″×1″ Double Angle Strip, forms a bearing for the Boiler End, over which it fits. The object of this bearing is to relieve the central shaft of strain. The shorter arms of

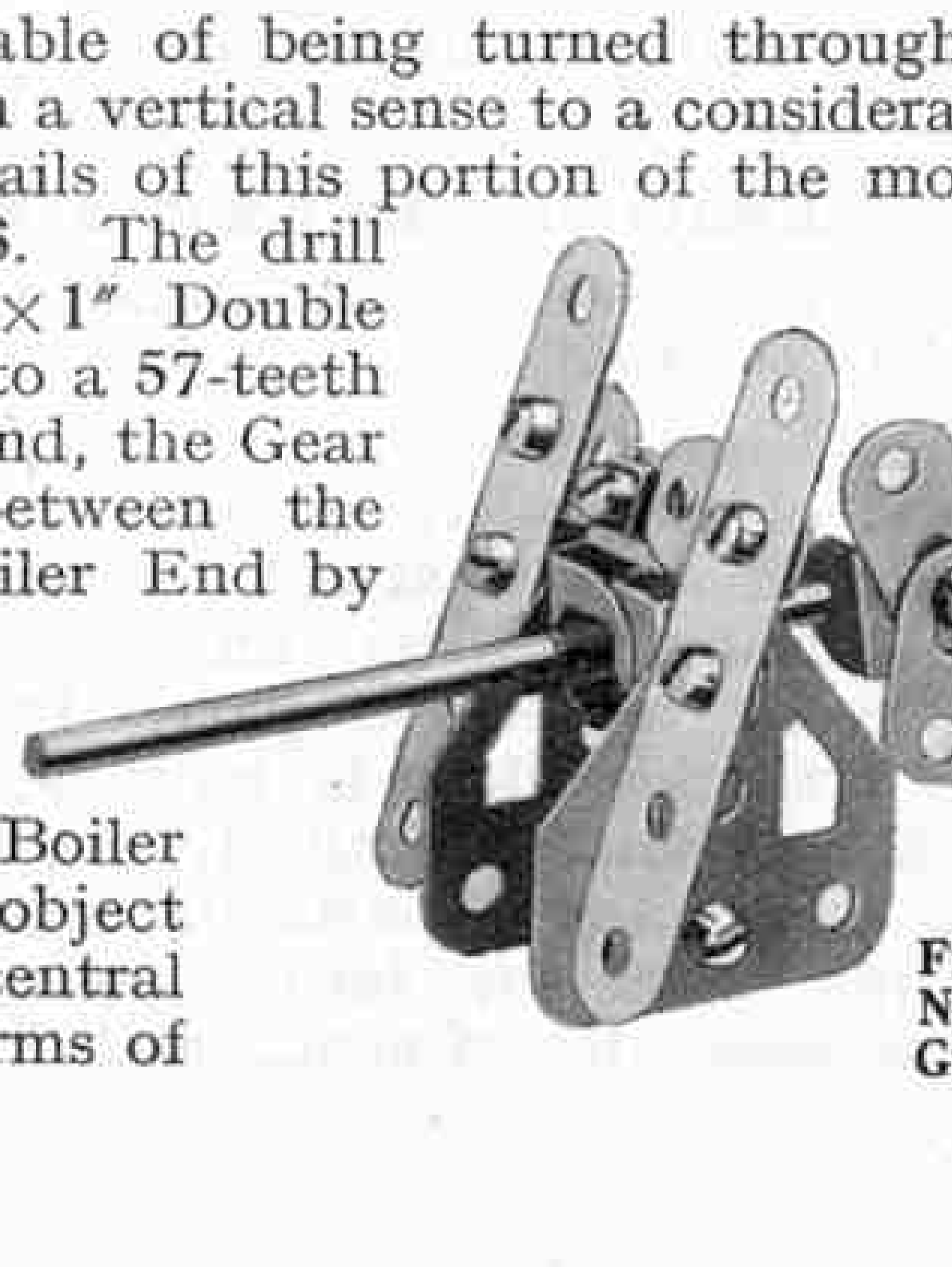


Fig. 3. Naval Gun.

the Double Angle Strip are attached to Double Arm Cranks secured by double grub-screws to a Rod 11, the latter having fixed to it a 57-teeth Gear that is in mesh with a Worm. By turning the 1″ fast Pulley mounted on the shaft carrying the Worm, the drill head may be rotated in a vertical direction. It may be rotated through a complete circle about the central shaft by turning a second 1″ Pulley mounted on a Rod carrying the Worm in mesh with the 57-teeth Gear 9a.

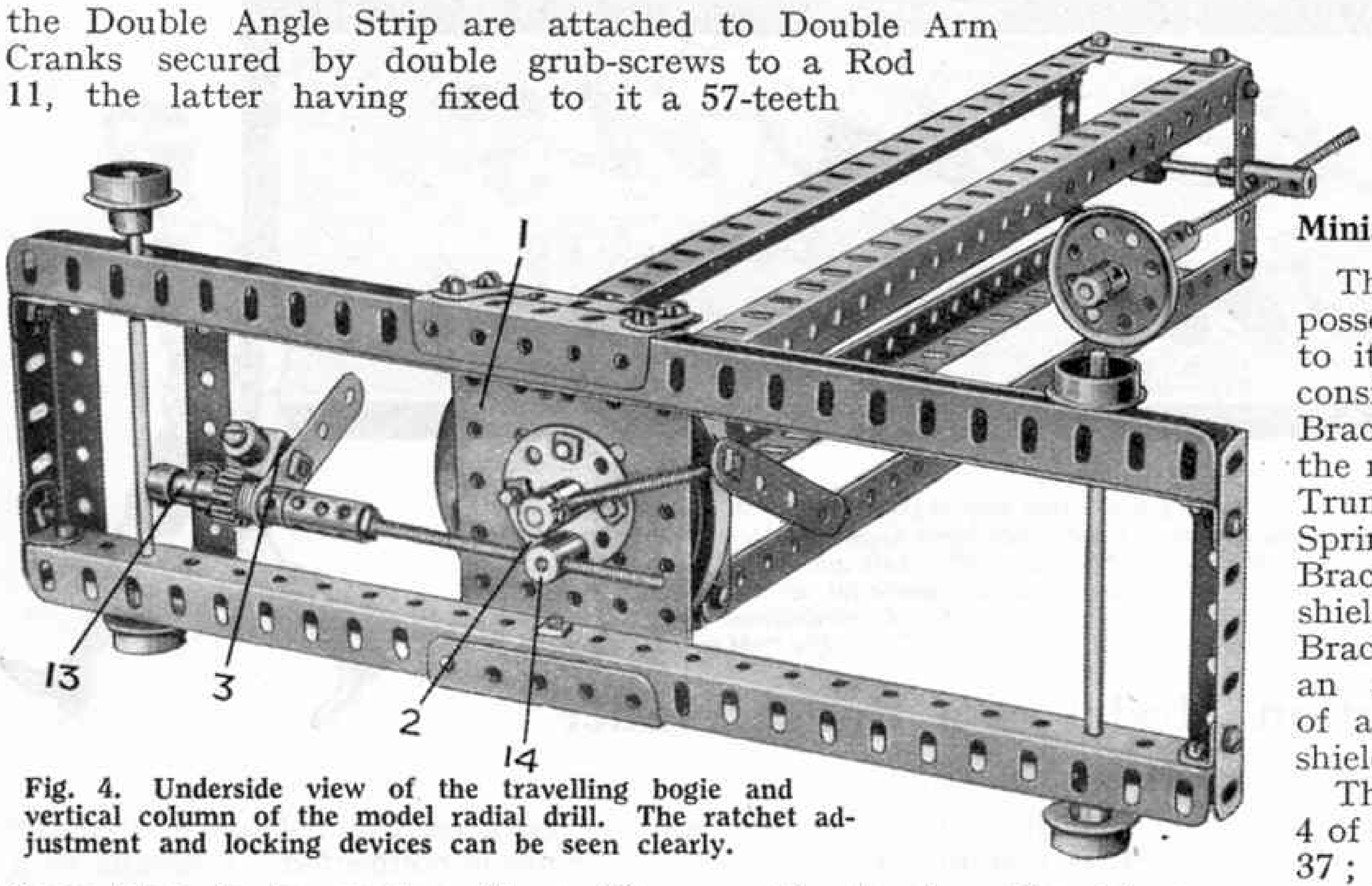


Fig. 4. Underside view of the travelling bogie and vertical column of the model radial drill. The ratchet adjustment and locking devices can be seen clearly.

The 11½″ Rod 12 conveying the drive from the Motor carries a ¾″ Contrate Wheel in mesh with a ½″ Pinion. This Pinion is loose on the Rod 11 and engages with a second ¾″ Contrate secured to a short Rod that passes through the "Boiler End-Wheel Flange" unit and terminates in a 1½″ Contrate Wheel. This Contrate drives the drill spindle, which may be moved longitudinally in its bearings in order to feed the drill into the work, and is actuated by a 2½″ Strip.

The drill used in the model is a 5/32″ twist drill, held in place by means of two bolts inserted at opposite sides of the Coupling to ensure that the drill is correctly centred. By using a small drill in this way the practical capabilities of the machine can be tested.

The motor armature spindle carries a ½″ Pinion in mesh with a 57-teeth Gear on a short Rod that carries also a ¾″ Pinion, which is in mesh with a 50-teeth Gear. This Gear is secured to a Rod that has at its upper end a ½″ Pinion, which is in mesh with a 1½″ Contrate on the end of the 11½″ Rod 12.

The Cranked Bent Strip 18 is provided for lifting the complete drilling machine.

In the construction of the drilling machine the following parts will be required :—2 of No. 3 ; 11 of No. 5 ; 8 of No. 6 ; 6 of No. 6a ; 12 of No. 8 ; 2 of No. 9b ; 4 of No. 9d ; 5 of No. 10 ; 8 of No. 11 ; 22 of No. 12 ; 1 of No. 12b ; 1 of No. 13 ; 3 of No. 15a ; 3 of No. 16 ; 2 of No. 16a ; 1 of No. 16b ; 4 of No. 17 ; 1 of No. 18a ; 1 of No. 19b ; 4 of No. 20b ; 2 of No. 21 ; 2 of No. 22 ; 2 of No. 24 ; 1 of No. 25 ; 4 of No. 26 ; 1 of No. 27 ; 3 of No. 27a ; 2 of No. 28 ; 2 of No. 29 ; 2 of No. 32 ; 117 of No. 37 ; 7 of No. 37a ; 35 of No. 38 ; 1 of No. 44 ; 2 of No. 46 ; 7 of No. 48a ; 6 of No. 53 ; 2 of No. 53a ; 25 of No. 59 ; 1 of No. 62a ; 2 of No. 62b ; 6 of No. 63 ; 1 of No. 64 ; 1 of No. 77 ; 1 of No. 80a ; 2 of No. 80b ; 1 of No. 81 ; 2 of No. 103f ; 2 of No. 108 ; 3 of No. 111 ; 2 of No. 111c ; 1 of No. 115 ; 4 of No. 126a ; 1 of No. 137 ; 2 of No. 136 ; 1 of No. 162a ; 1 Electric Motor.

Meccano Mouse Trap

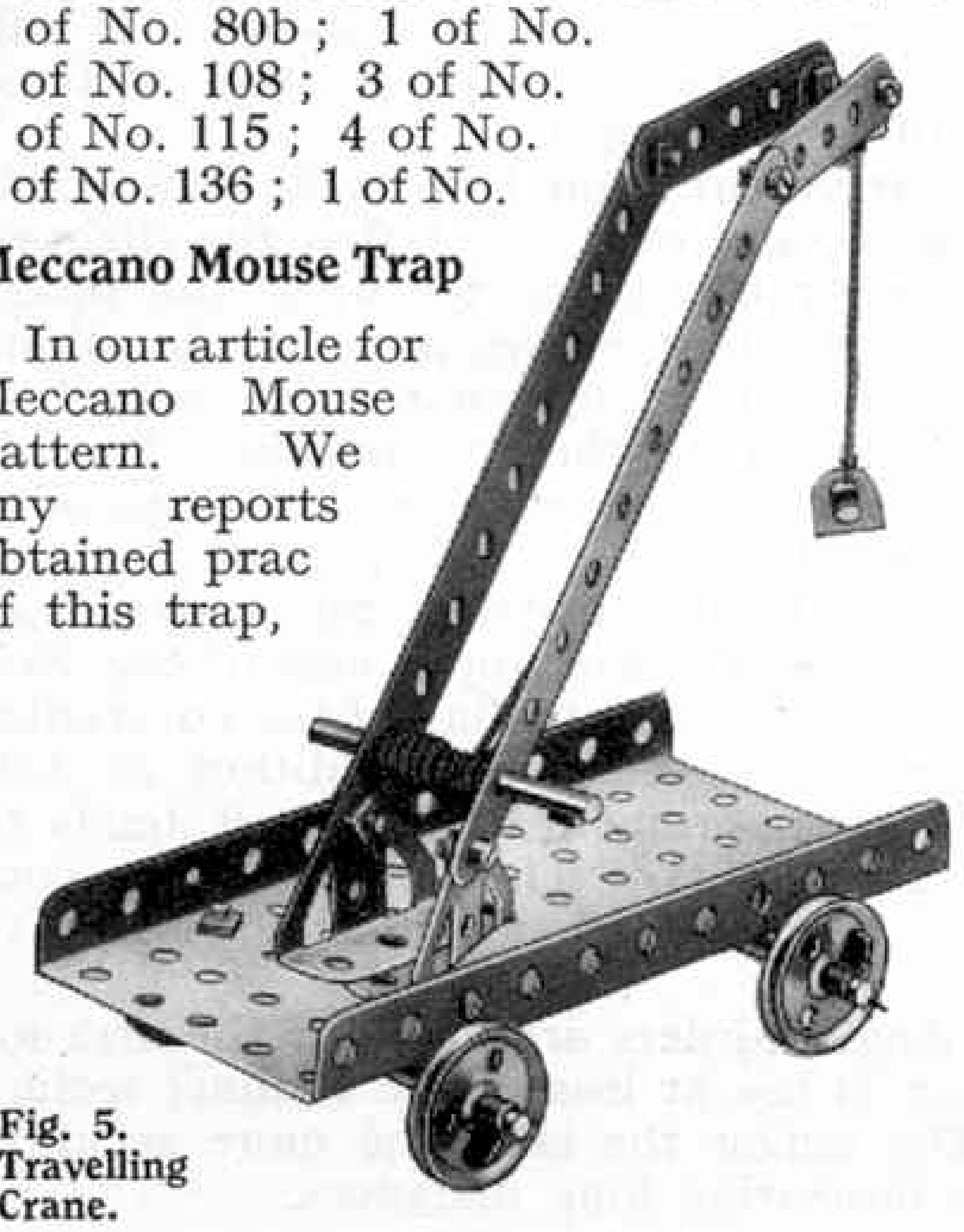


Fig. 5. Travelling Crane.

In our article for May last we described a Meccano Mouse Trap of the "nipper" pattern. We have not yet received any reports from readers who have obtained practical results from the use of this trap, but we are still hopeful! The model mouse trap shown in Fig. 2 cannot, we regret to say, be put to practical use, but it nevertheless shows that a very good representation of a mouse trap can be constructed with even a "OOO" Outfit! The construction of the model may be seen quite clearly in the illustration.

In order to build the Mouse Trap the following parts will be required :—2 of No. 2 ; 2 of No. 5 ; 1 of No. 10 ; 2 of No. 12 ; 2 of No. 16 ; 4 of No. 35 ; 12 of No. 37 ; 1 of No. 40 ; 2 of No. 126.

Miniature Naval Gun

The model quick-firing gun shown in Fig. 3, though small, possesses quite a realistic appearance, the "gun shields" fitted to it further increasing this effect. The base of the model consists of two Flat Trunnions spaced apart by means of Angle Brackets. The gun barrel (a 3½″ Axle Rod) is supported in the round holes of two Angle Brackets that are secured to the Trunnions. The Axle Rod is held in place by means of two Spring Clips, as is also the Angle Bracket carrying two Flat Brackets that is placed on the end of the Rod. The gun shields consist of 2½″ Strips secured to the gun by Angle Brackets. A Flat Bracket is secured to each Strip, and an Angle Bracket is clamped between them by means of a bolt and two nuts to form the upper part of the shield.

The model gun contains the following parts :—2 of No. 5 ; 4 of No. 10 ; 6 of No. 12 ; 1 of No. 16 ; 4 of No. 35 ; 9 of No. 37 ; 1 of No. 37a ; 2 of No. 126a.

Railway Breakdown Crane

The final example to be shown this month is a model travelling crane (Fig. 5). As will be seen, it is very simple, and its construction should not present any difficulty. It should be noted, however, that the crane superstructure is pivoted to the base by means of a bolt and two nuts, the bolt being pushed up from the underside of the Plate and the two nuts locked on each side of the Trunnions forming the superstructure base. The parts needed for the breakdown crane are as follows: 2 of No. 2 ; 2 of No. 5 ; 3 of No. 12 ; 2 of No. 16 ; 1 of No. 17 ; 4 of No. 22a ; 4 of No. 35 ; 11 of No. 37 ; 1 of No. 37a ; 2 of No. 48a ; 1 of No. 52 ; 2 of No. 126.

The model just described represents perhaps the limit in simplicity of construction in a model breakdown crane, and it provides a remarkable contrast with the large Breakdown Crane described in last month's and this month's issues.

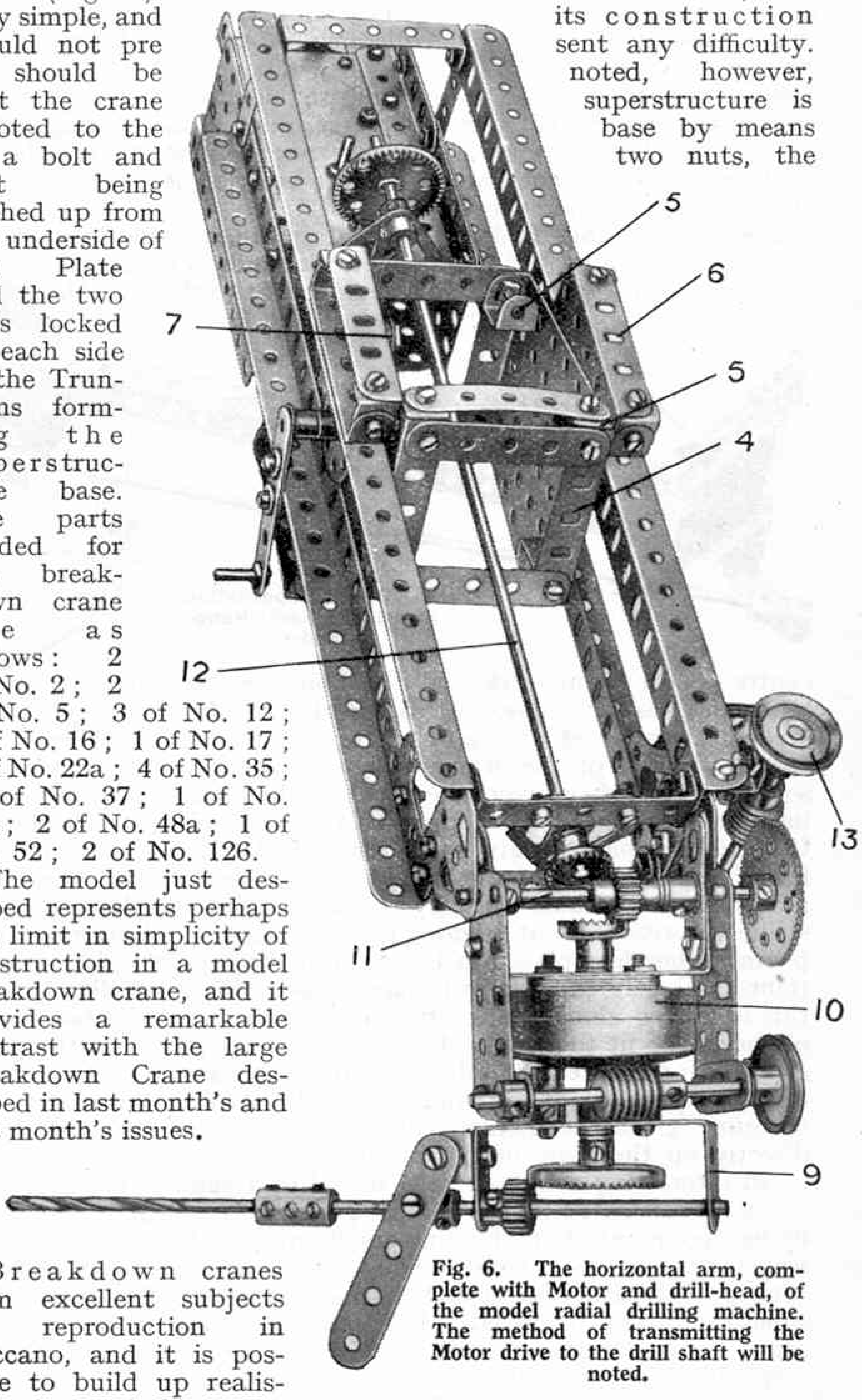
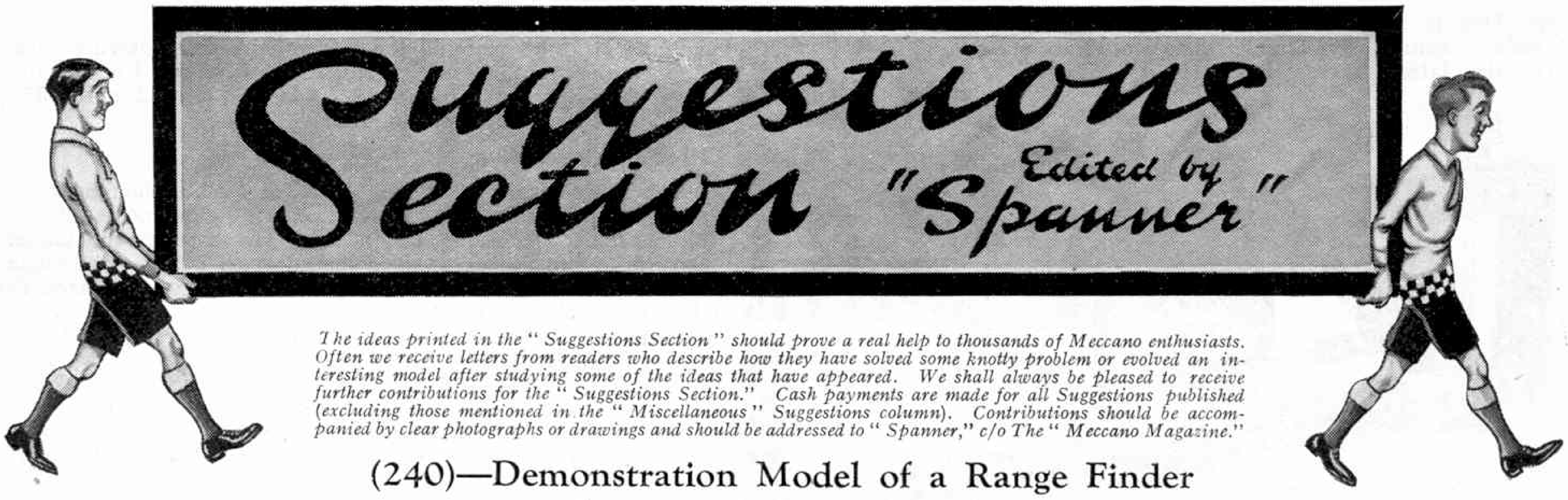


Fig. 6. The horizontal arm, complete with Motor and drill-head, of the model radial drilling machine. The method of transmitting the Motor drive to the drill shaft will be noted.

Breakdown cranes form excellent subjects for reproduction in Meccano, and it is possible to build up realistic models of this type of crane with any Outfit. The model Railway Breakdown Crane shown in the 00-3 Instructions Manual (Model No. 3.55, see page 120) is an interesting example of this type of construction. This model Crane, although naturally not so elaborate as the Super Model, possesses a realistic appearance and it incorporates three distinct movements, namely, luffing, slewing and hoisting. Those model-builders who have the parts available will find it a splendid model to construct.



Suggestions Section

Edited by "Spanner"

The ideas printed in the "Suggestions Section" should prove a real help to thousands of Meccano enthusiasts. Often we receive letters from readers who describe how they have solved some knotty problem or evolved an interesting model after studying some of the ideas that have appeared. We shall always be pleased to receive further contributions for the "Suggestions Section." Cash payments are made for all Suggestions published (excluding those mentioned in the "Miscellaneous" Suggestions column). Contributions should be accompanied by clear photographs or drawings and should be addressed to "Spanner," c/o The "Meccano Magazine."

(240)—Demonstration Model of a Range Finder

(*P. Rodgers, Crookesmoor, Sheffield*)

One of the most remarkable features of modern naval warfare is that the men who serve the guns never see their target. They are under the control of one man who, from a heavily armoured room in another part of the ship, decides the direction and range, and speeds the shells on their way by the mere touch of a switch.

This modern miracle is made possible by means of a number of ingenious instruments, the most important of which is the range finder that enables the distance of the object fired at to be measured accurately and rapidly. The design of an instrument of this kind is not an easy matter, for the range of modern weapons is up to 15 miles, or even more; and during naval battles warships are invariably steaming along at speeds up to 25 or even 30 knots, while smaller vessels such as destroyers develop even greater speeds.

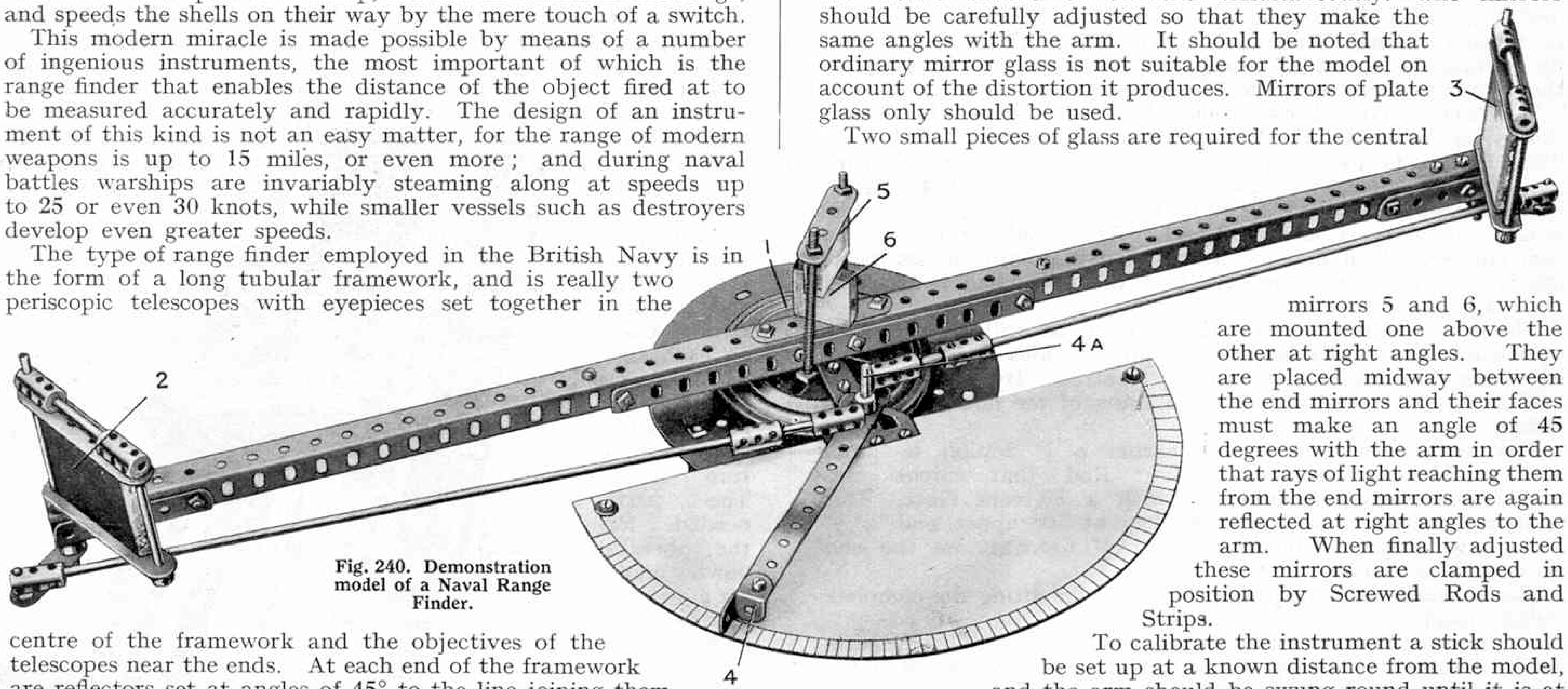


Fig. 240. Demonstration model of a Naval Range Finder.

The type of range finder employed in the British Navy is in the form of a long tubular framework, and is really two periscopic telescopes with eyepieces set together in the centre of the framework and the objectives of the telescopes near the ends. At each end of the framework are reflectors set at angles of 45° to the line joining them. In the middle of the framework are two reflecting prisms, so placed that they divert the rays of light from the end reflectors into the eyepieces. The upper half of the field of view seen in the right eyepiece is given by the right-hand reflector, and the lower half by that at the opposite end. In general these will not coincide, because the rays of light from the distant object strike the reflectors at slightly different angles. A narrow angle prism is therefore placed in the path of the rays of light from the right-hand side in order to change their direction slightly, and this is moved along the interior of the tube until the two halves of the image fit together. The distance through which the prism is moved measures directly the angle between the directions of the rays of light reaching the ends of the rangefinder, and therefore gives the distance of the object seen. This is shown directly on the scale of the instrument.

An interesting demonstration model of a simple type of range finder is illustrated in Fig. 240. In form it resembles the range finder described, but the mirrors 2 and 3 at the ends of the framework are not fixed. They are free to swivel and are connected together so that they move through the same angle when the lever 4 is moved. This enables the use of the deflecting prism to be dispensed with, and gives an instrument that is surprisingly accurate over a wide range.

The framework of the Meccano model is composed of four 12½″ Angle Girders bolted together to form a channel section girder. The girders are secured to the upper portion of the Ball Bearing, and a 7½″ Angle Girder is bolted to the inner ends to give additional rigidity. Small pieces of plate glass mirror, 2 and 3, are clamped in suitable frames at each end of the arm, and these mirrors may be swivelled by means of a lever 4. Each of the mirror frames is mounted in the end holes of the arm so that it is free to swing, and a Crank on the bottom end of the Rod forming the pivot of the frame is connected by means of a length of rod to the lever 4. By moving the lever the frames are moved inward or outward simultaneously. The mirrors should be carefully adjusted so that they make the same angles with the arm. It should be noted that ordinary mirror glass is not suitable for the model on account of the distortion it produces. Mirrors of plate glass only should be used.

Two small pieces of glass are required for the central mirrors 5 and 6, which are mounted one above the other at right angles. They are placed midway between the end mirrors and their faces must make an angle of 45 degrees with the arm in order that rays of light reaching them from the end mirrors are again reflected at right angles to the arm. When finally adjusted these mirrors are clamped in position by Screwed Rods and Strips.

To calibrate the instrument a stick should be set up at a known distance from the model, and the arm should be swung round until it is at right angles to the line of sight when looking at the object. The end mirrors are now manipulated by means of the lever 4 until the reflected images from each mirror are seen in the central mirrors one above the other. The position of the lever is then marked on the scale. Before this result can be attained all the mirrors will require careful adjustment. Other distances may be set down on the scale in a similar manner, but it will be found that as the distance increases, so do the graduations on the scale diminish for any given units of distance. It will be advisable, therefore, to calibrate the scale in steps of tens, hundreds, and thousands of feet or yards.

For long distances the instrument should be made more rigid than the one illustrated, on account of the fact that the slightest vibration of the arm at long range tends to throw the image right off the mirrors, and at the best makes difficult the taking of accurate readings. Another important point is the reduction of backlash in the various parts of the mechanism. To this end, therefore, all joints, etc., should be made as stiff as possible without sacrificing ease of manipulation.

A refinement may be added to the model in the shape of an eyepiece, which may be mounted on the upper end of the Rod 4a so that its centre is opposite the dividing line of the two centre mirrors. Some readers may find that the addition of this eyepiece makes the use of the instrument easier, as it tends to concentrate the gaze on the mirrors. The eyepiece may consist of two or more Sleeve Pieces fitted one over the other to form a long tube.

In the illustration 12½″ Angle Girders are used for the arm for convenience, but it is better to use at least three channel section girders each 24½″ long. The longer the arm, the more accurate the instrument will be for measuring long distances.

(241)—A Range Finder for Short Distances

(*L. Simonds, Bromley, Kent*)

Another type of range finder is illustrated in Fig. 241, from which it will be seen that it is very compact and forms a striking contrast to the one depicted on the previous page. It is intended for measuring distances up to 15 or 20 ft. A 2″ and a 2½″ Strip are bolted to each end of a 1½″×½″ Double Angle Strip, and to each of the lower ends of these two Strips two large radius 2½″ Curved Strips are bolted, in the manner indicated. A 3″ Strip pivoted to the 1½″×½″ Double Angle Strip is free to swing between the two Curved Strips, and is fitted with a weight at its lower end in the shape of an End Bearing.

To use the range finder the two holes in the ends of the Double Angle Strip are brought in line with the foot of the object the distance of which has to be measured. Whatever the angle the Double Angle Strip makes with the ground, the 3″ Strip hangs vertically downward and swings over the scale marked on the Curved Strip, as shown in the diagram. To calibrate the instrument it is directed at the feet of several objects placed at known distances, and the corresponding positions of the 3″ Strip marked on the Curved Strip. Paper is gummed to the Strip for the scale and a small pointer, also cut out of paper, is stuck on the 3″ Strip.

It is essential to direct the instrument upon the foot of the object since the angle of tilt is the essential factor giving the distance. It will be realised, therefore, that the device cannot be relied on to give accurate results when the object of which the range is required is at a higher or lower level than the observer, and it will give different readings when used by observers of different heights. The instrument should prove useful to amateur photographers, who often experience considerable difficulty in judging distances when setting the focussing scale. For this purpose it will be found convenient to graduate the scale of the range finder according to the figures marked on the camera. It should, of course, be calibrated by the individual who intends to use it, for reasons stated above.

(242)—A Useful Soldering Iron Stand

(*H. Desmond, Kidderminster*)

Fig. 242 shows a neat stand for a soldering iron. It consists essentially of two pairs of 5½″ Strips joined together at their lower ends by 2½″×½″ Double Angle Strips, the Strips being connected together by lock-nutted bolts. The iron is placed in the V's formed by the upper ends of the Strips. An interesting feature of the device is the fact that the height may be adjusted by moving the connecting Strip 1 and fixing it in position on the bolt by a locking handle 2. In this manner the soldering iron may be adjusted to suit the height of the flame of a lamp placed underneath it, as shown in the illustration. The construction of the model may be varied to suit the type of lamp that is employed for heating purposes.

(243)—An Ingenious Flashing Sign

(*M. Woods, Corton, Suffolk*)

Flashing signs nowadays are familiar sights in most of our large towns, and many Meccano boys must have considered the possibility of constructing such a device with the aid of Meccano. A flashing sign made from Meccano parts was described in the July, 1928 "*M.M.*", and it operates in a realistic and thoroughly reliable manner. M. Woods was inspired by this model to construct a similar device, but of a simpler nature, in the following manner.

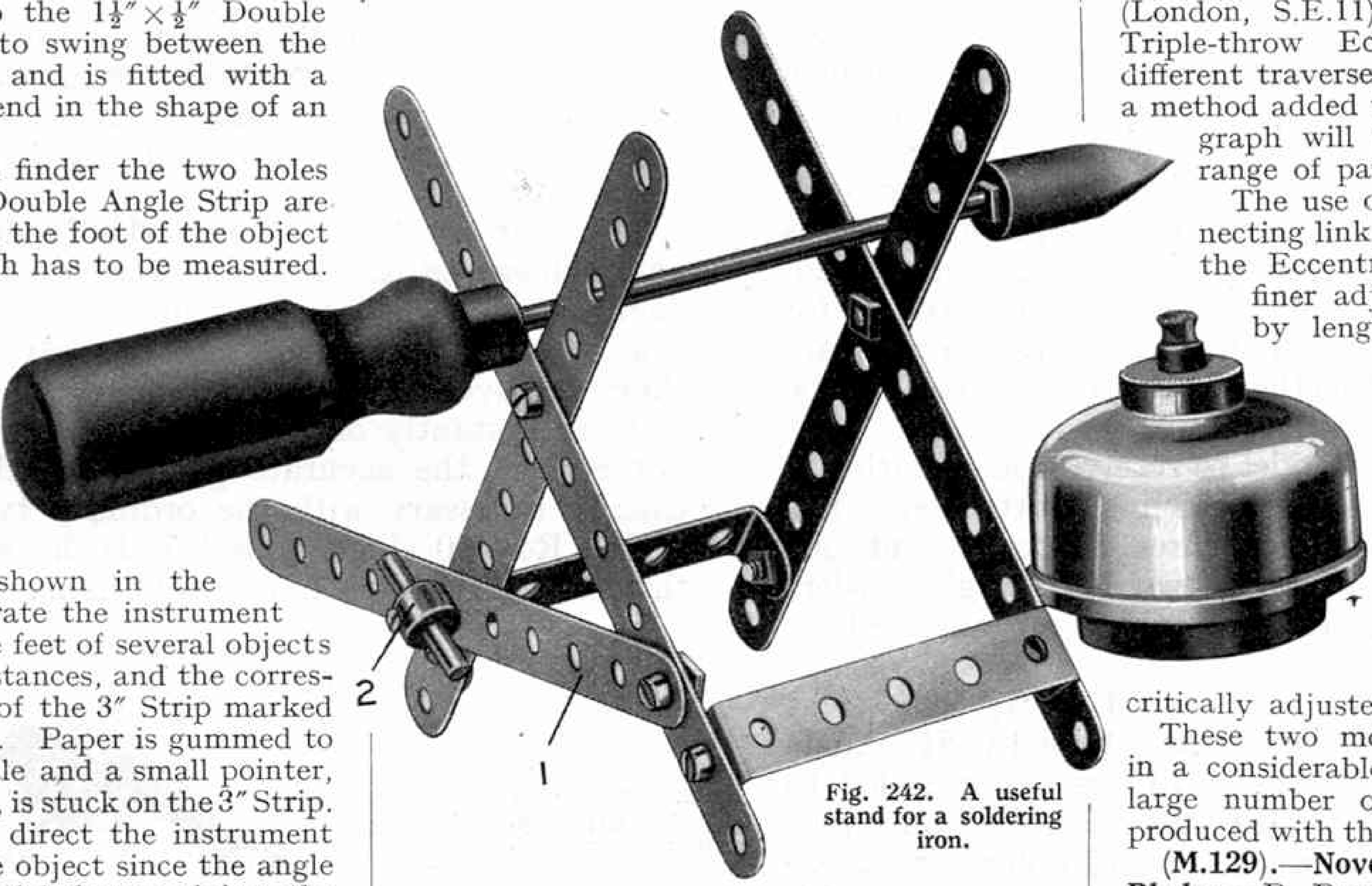


Fig. 242. A useful stand for a soldering iron.

A number of Strips, secured by Wood Screws to a baseboard, are arranged parallel to each other and a short distance apart. As many Strips as there are lamps in the sign will be required, and each Strip is spaced the thickness of a Washer above the board. A Strip is now caused to slide under the rows of fixed Strips so that it makes contact with each of the Strips in turn, thus lighting up the lamps in the sign one after the other by completing the circuit. When the sliding Strip is in contact with all the fixed Strips, all the lamps of the sign will glow, and when the Strip commences to slide in the reverse direction the lamps will go out.

The sliding Strip may be actuated by a simple crank mechanism driven by an Electric Motor, and in this connection it may be mentioned that an interesting modification may be made to the device by incorporating a quick-return motion.

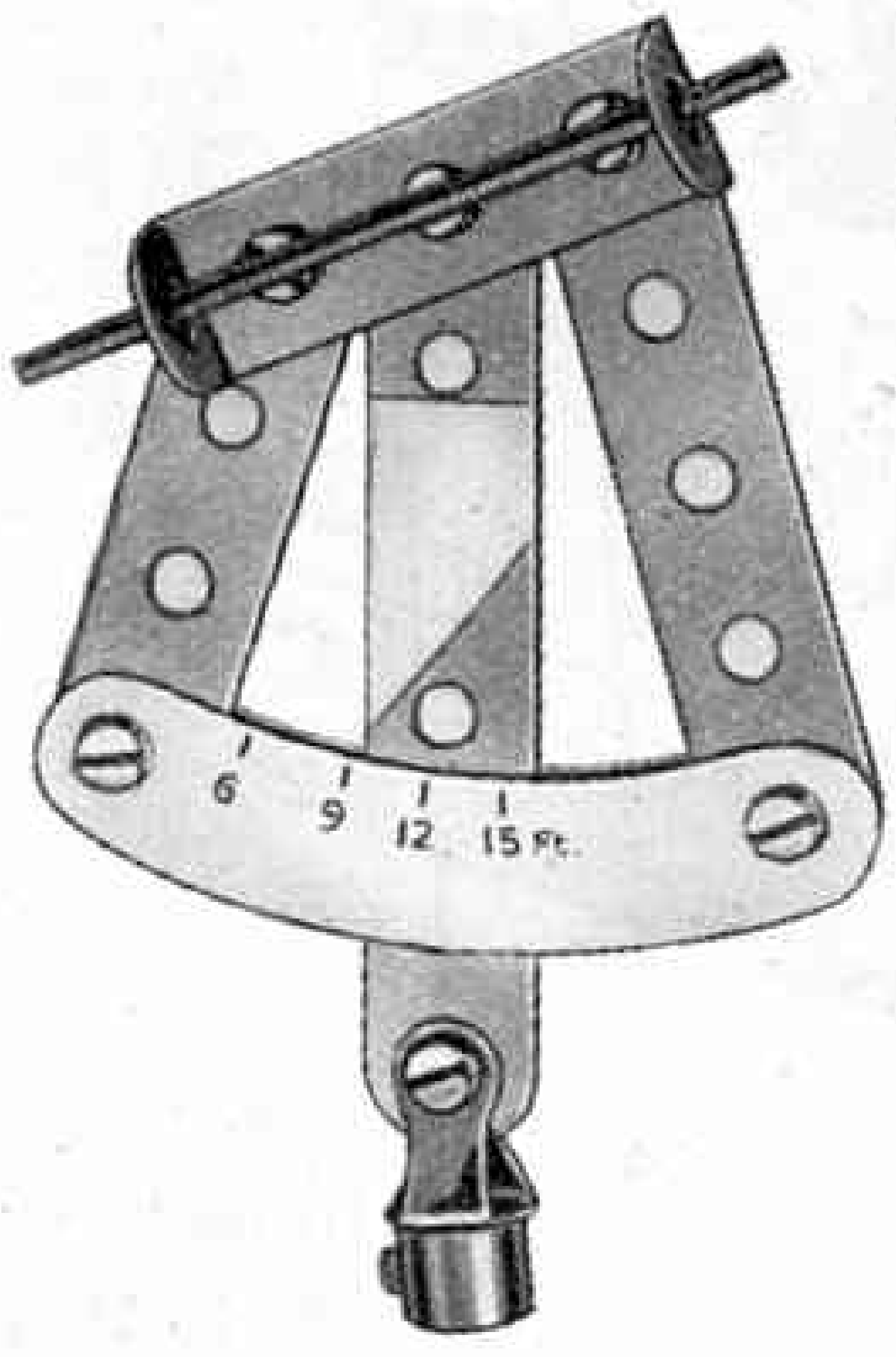


Fig. 241. Range finder for short distances.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.128).—Interesting Improvement to the Meccanograph.—Those of our readers who have built up the Meccanograph will know that the sliding carriage carrying the writing arm is slid to and fro upon its guides by a Strip, that is attached to the carriage and to a pin on the Bush Wheel driven from the gear box. H. Gawlik (London, S.E.11) suggests the use of a Triple-throw Eccentric to give three different traverses to the carriage. Such a method added to the standard Meccanograph will be found to extend the range of patterns considerably.

The use of an 11½″ Rod as a connecting link between the carriage and the Eccentric will permit of much finer adjustment than is possible by lengthening or shortening a Strip. The Rod is attached to the " strap " of the Eccentric by Collars or Handrail Supports, the Grub Screws of which are loosened to effect adjustment of the Rods. A Rod is also used for the writing arm, so that the position of its fulcrum may be critically adjusted.

These two modifications should result in a considerable increase in the already large number of designs that may be produced with the standard Meccanograph.

(M.129).—Novel Use for Old Safety Razor Blades.—R. Pearce (Bristol) suggests that a handy vegetable peeler may be made from discarded safety razor blades, a suitable handle being composed of Strips or Rods. An adjustable guard, by which the thickness of a slice may be regulated, is an added refinement.

(M.130).—A Use for Flat Brackets.—Many Meccano boys are interested in wireless, and must therefore often require spade terminals to facilitate the connection of wires to terminals. E. Pay, Blacker Hill, near Barnsley, points out that terminals of this type may be contrived from Flat Brackets. The top of the slotted hole of the Flat Bracket is cut off, thus leaving two prongs, which may be easily fitted under terminals.

(M.131).—A Burglar Alarm.—A burglar alarm suggested by S. Wild (Ashton-u-Lyne), is arranged in the following manner. A 2½″×½″ Double Angle Strip is screwed to a piece of board. A 3½″ Strip is next pivoted by its centre hole on a screw fixed in the board so that one end may make contact with either end of the Double Angle Strip, and a Spring is attached to the other end of the 3½″ Strip. A thread is attached to the Strip and to the window frame, so that when the window is opened the thread pulls the Strip over, thus completing the circuit and ringing a bell. If on the other hand, the enterprising burglar discovers the thread and cuts it, he is dismayed to hear the bell spreading the alarm. This is due to the fact that the spring pulls the lever over against the opposite end of the Double Angle Strip, which again completes the circuit.

The same device may be used as a fire alarm, the electric circuit being completed immediately the cotton is burnt through.

New Meccano Model

Railway Breakdown Crane

Completion of Instructions for building this Fine Model

IN the first instalment of this article dealing with the construction of the Meccano Railway Breakdown Crane, which appeared last month, the construction of the crane truck and bogie was described, and providing our instructions were carefully followed the model-builder may now proceed with the remaining portions of the model, which include the superstructure, jib, gear box mechanism, and resistance controller for the Motor. Full details for dealing with each part are given in this article, together with instructions for the final assembly of the various units.

The next item of the model to receive consideration is the gear box and the base to which it is attached. The latter consists essentially of three 5½"×3½" and one 5½"×2½" Flat Plates bolted to two 12½" Angle Girders 23 (Figs. 6 and 7) the ends of which are spanned by 5½" Angle Girders.

The sides of the gear box consist of 5½"×3½" Flat Plates 24 that are attached to the base by 5½" Angle Girders 25 (Fig. 7), 3½" Angle Girders being added to the front edges of the Plates for stiffening purposes. Two 2½" Triangular Plates 27 (Fig. 6) secured to these Girders will eventually form the bearings for the jib pivot pin.

The reinforced bearings for the vertical Rods carrying the 1½" Bevel 41 and ½" Pinion 43 (Fig. 7) should next be secured in place. The Flanged Ball Race forming the upper portion of the Meccano Ball Bearing, on which the model turns, is fixed centrally under the latter bearing, being held in place by four ½" Bolts and spaced away from the underside of the superstructure by four Collars placed upon the bolts.

The gear box layout is remarkably simple, due to the employment of an entirely new principle in Meccano engineering. The chief advantage of this gear box is that none of the Axle Rods or Gears are required to slide transversely. Consequently the Gears may be engaged instantly on movement of a lever and they do not require the accurate placing on the Rods that is usually necessary with the ordinary type of gear box.

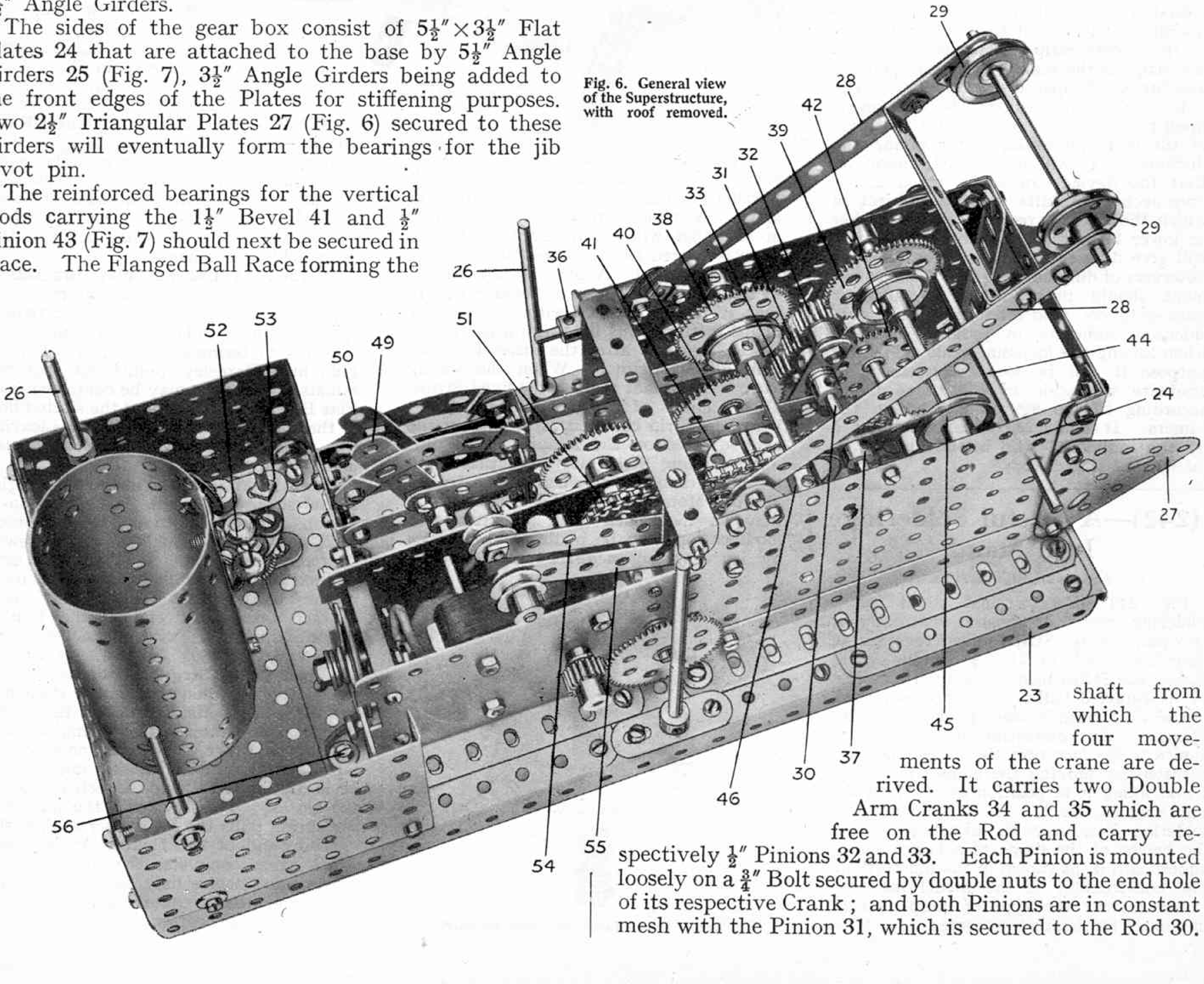


Fig. 6. General view of the Superstructure, with roof removed.

The Rod 30 (Figs. 6 and 7) is driven by the Motor through the medium of Sprocket Chain and forms the main shaft from which the four movements of the crane are derived. It carries two Double Arm Cranks 34 and 35 which are free on the Rod and carry respectively ½" Pinions 32 and 33. Each Pinion is mounted loosely on a ¾" Bolt secured by double nuts to the end hole of its respective Crank; and both Pinions are in constant mesh with the Pinion 31, which is secured to the Rod 30.

The 57-teeth Gears 38 and 39 are secured to the luffing and hoisting winch barrels respectively and by manipulating the lever 49 the Crank 34 is rocked backward or forward on its shaft and the Pinion 32 is brought into engagement with either of these Gears 38 or 39.

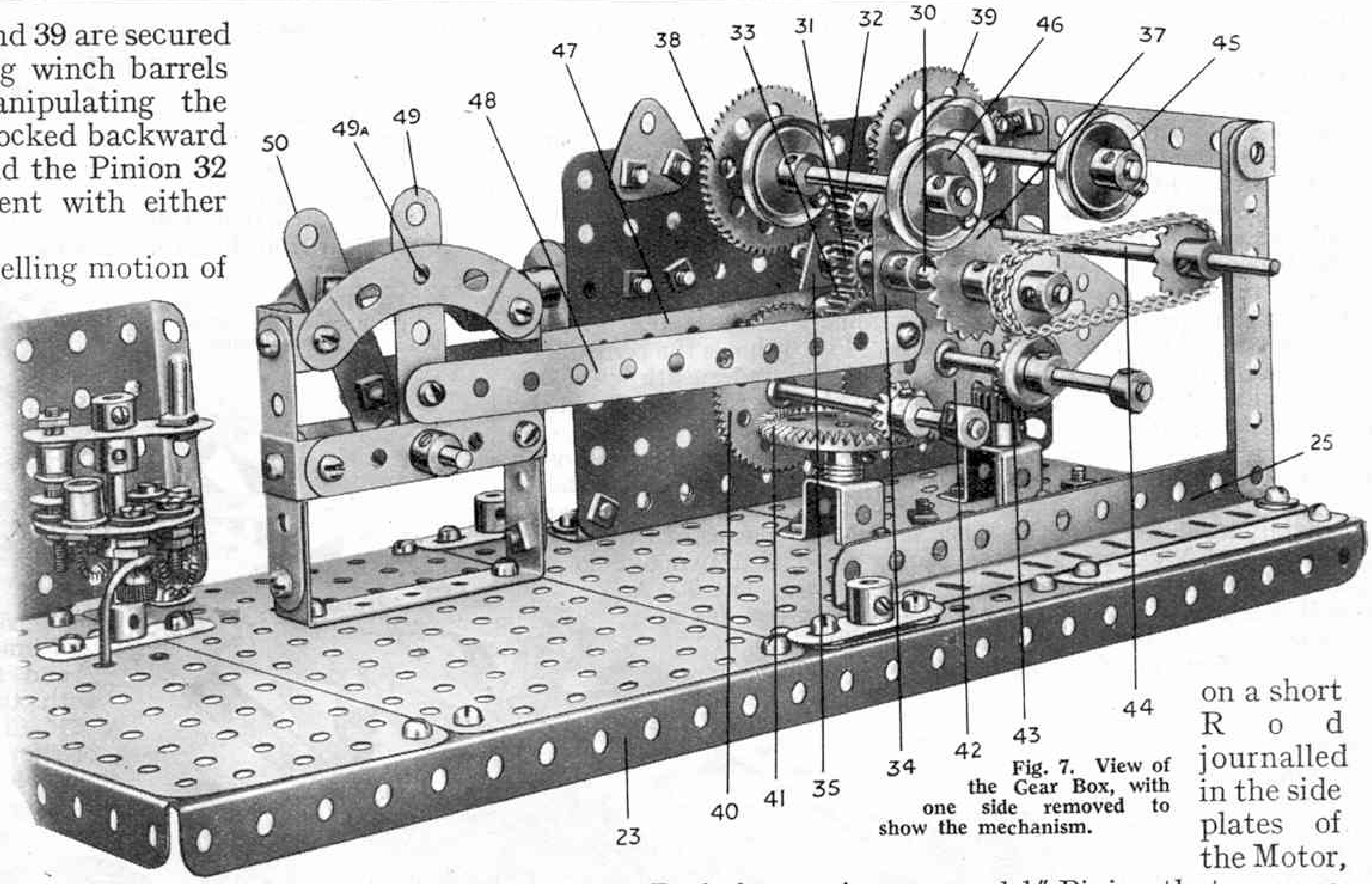


Fig. 7. View of the Gear Box, with one side removed to show the mechanism.

With regard to the travelling motion of the model, this is derived from the Rod on which a 57-teeth Gear 42 is secured. The Rod carries also a ¾" Contrate that is in constant mesh with a ½" Pinion 43 secured on the top of the vertical Rod that forms the central pivot of the model and which has the Pinion 17 (see Fig. 5 in the July "*M.M.*") secured to its lower extremity. This vertical Rod, after passing through the Double Bent Strip and Plate in the base of the superstructure, is journalled freely in the Flanged Ball Race that is bolted directly underneath the Plate. The Rod also is free to turn in the boss of the Gear 4.

The slewing movement is obtained as follows: A 57-teeth Gear 40 is secured to a Rod carrying also a ½" Bevel in mesh with a Bevel 41. This Bevel is fixed to a short Rod carrying at its bottom end a ½" Pinion that will mesh with the Gear 4 (Fig. 2 July "*M.M.*"), which forms part of the Ball Bearing (see Standard Mechanisms No. 144). Both the Rods carrying the Pinion 43 and the Bevel 41 are journalled in the reinforced bearings mentioned previously, and the four Rods on which the Gears 38, 39, 40 and 42 are secured, are journalled in the side Plates of the gear box and are restrained from lateral movement by Collars.

By moving the lever 50 either the travelling or slewing movements of the model may be brought into action and if desired either the luffing or hoisting motions may be used at the same time.

The construction of the lever frame will be clear on reference to Fig. 7. The 2½" Strips 49 and 50, forming the levers proper, are pivoted in their bottom holes on a Rod that is carried in two 2½" Strips forming part of the frame. The 5½" Strips 47 and 48 form the connecting links between the levers and their respective Double Arm Cranks, the connections being made by lock-nutted bolts. In order to lock the lever 49 in either hoisting, luffing or neutral positions and the lever 50 in either travelling, slewing or neutral positions, round-headed Bolts 49a are bolted on the second hole of each lever so that their rounded heads engage with holes in the quadrants after each movement of the levers. The latter should, of course, be spaced on their pivot rod so that the bolts are pressed firmly against the quadrants.

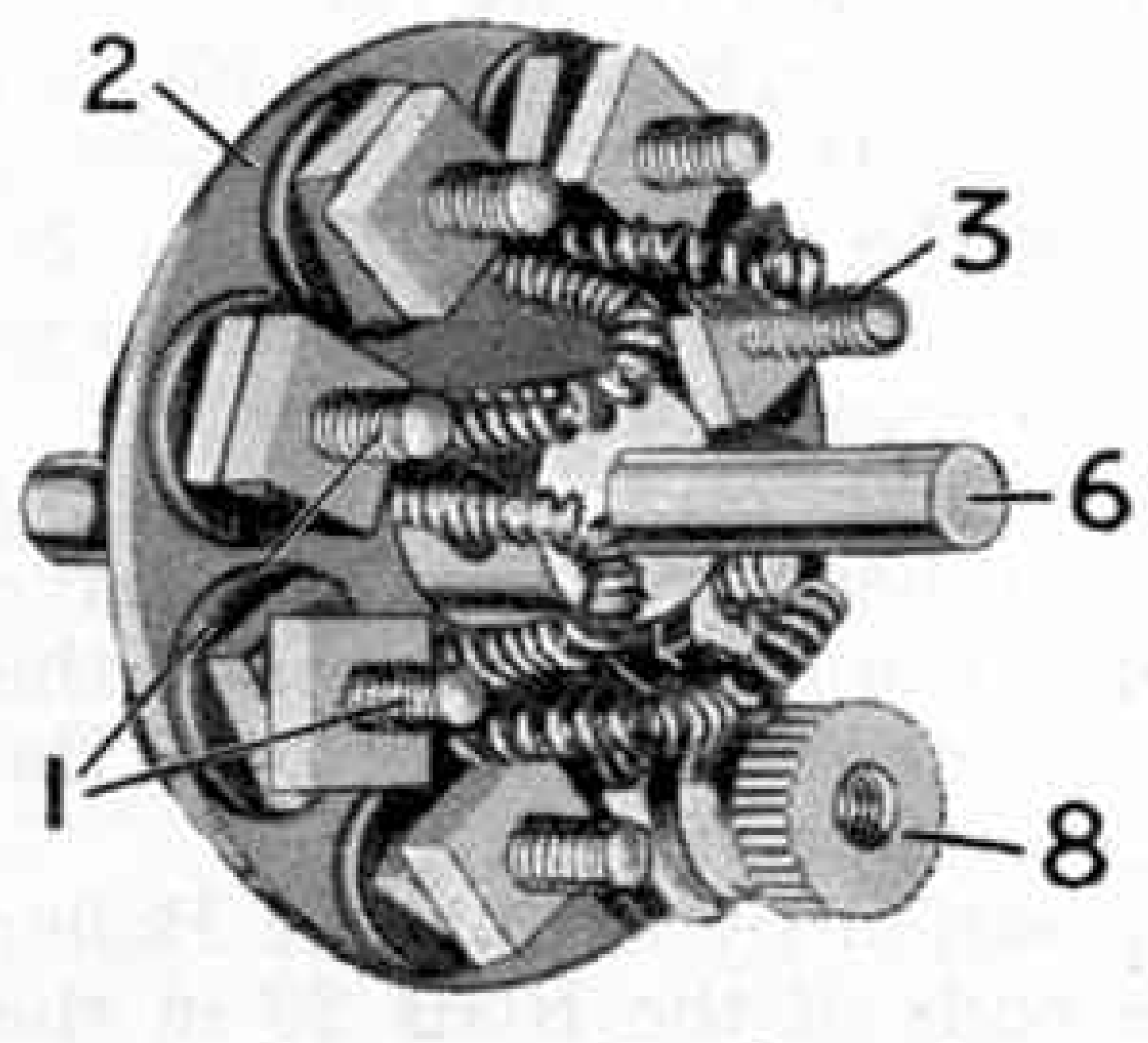


Fig. 8. Underneath view of the Controller Unit showing the resistances.

The Motor gearing is arranged as follows: A ½" Pinion on the armature spindle meshes with a 57-teeth Gear on a short Rod journalled in the side plates of the Motor, and this Rod also carries a second ½" Pinion that engages with a 57-teeth Gear on another Rod that is vertically above the first. This Rod has a 1" Sprocket 51 secured to it. The Motor may now be bolted down in the position indicated in Fig. 6 and the Sprocket 37 on the main shaft 30 connected with that on the Motor by a length of Sprocket Chain. The 1" fast Pulleys 45 and 46 on the hoisting and luffing winch barrels comprise the brake drums. A length of cord is wrapped round each Pulley, one end being fastened to a suitable part of the framework and the other to the appropriate brake lever 54 or 55 (Fig. 6). These levers consist of 3" Strips attached pivotally to a Single Bent Strip that is bolted to a 3½" Double Angle Strip spanning the sides of the gear box. The extremities of the brake levers are weighted with ½" fast Pulleys in order to maintain the cord in a slight state of tension round the brake drums, and thus prevent the load or the jib descending when the barrels are thrown out of gear.

Having assembled the mechanism, two Strips 28 may be attached pivotally to 1" Triangular Plates that are bolted to the gear box side Plates. The ends of the Strips are spaced apart by a 3"×1½" Double Angle Strip and a 3½" Rod journalled in the extreme end holes carries the Pulleys 29.

The cylinder 36 (Fig. 6) gives additional realism to the model. It consists of a Sleeve Piece with two ¾" Flanged Wheels forming the cylinder covers through which the piston rod passes. An End Bearing on the end of the latter is attached pivotally to the connecting rod, the other end of which is pivoted by a lock-nutted bolt to the crank disc. The crank disc consists of a Bush Wheel, and is secured on the Rod 44 (Figs. 6 and 7), which is driven from the main shaft 30 through the medium of a length of Sprocket Chain passing over ¾" Sprocket Wheels. The appearance of the cylinder, etc., will be gathered from the general view of the model.

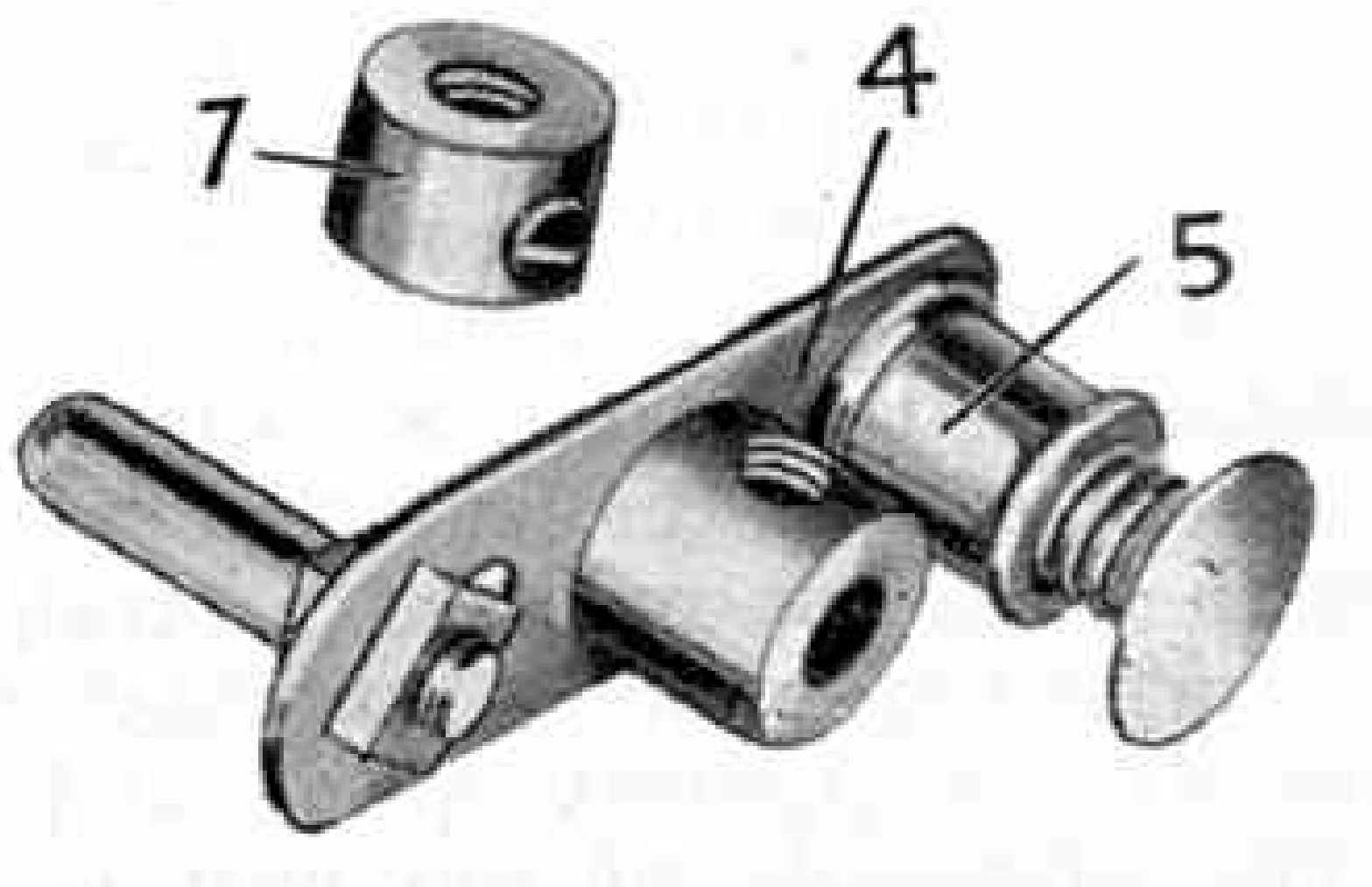


Fig. 9. Detail view of the Controller Switch Arm.

The boiler is attached to a 5½"×2½" Flat Plate that forms part of the coal bunker, the sides of which are formed from 3½″ × 2½″ Flanged Plates. Rods 26 are secured to the Flanged Plates by means of Collars, the purpose of the Rods being to form supports for the roof. Two further Rods 26 are needed for this purpose and they are inserted in Double Arm Cranks that are secured to the base in the positions indicated in Fig. 6.

The boiler fittings include a pressure gauge, represented by a ½″ loose Pulley, and a water gauge 52 composed of a 1½″ Rod secured in two Handrail Supports and attached to the front of the boiler.

The resistance controller 53 (Fig. 6), the function of which is to alter the speed of the Motor, is extremely compact and is built entirely from standard Meccano parts. Fig. 6 shows the controller in place whilst Fig. 8 gives an idea of the underneath view of the device with the resistance elements in place. Fig. 9 is a detailed view of the switch arm and spring contact.

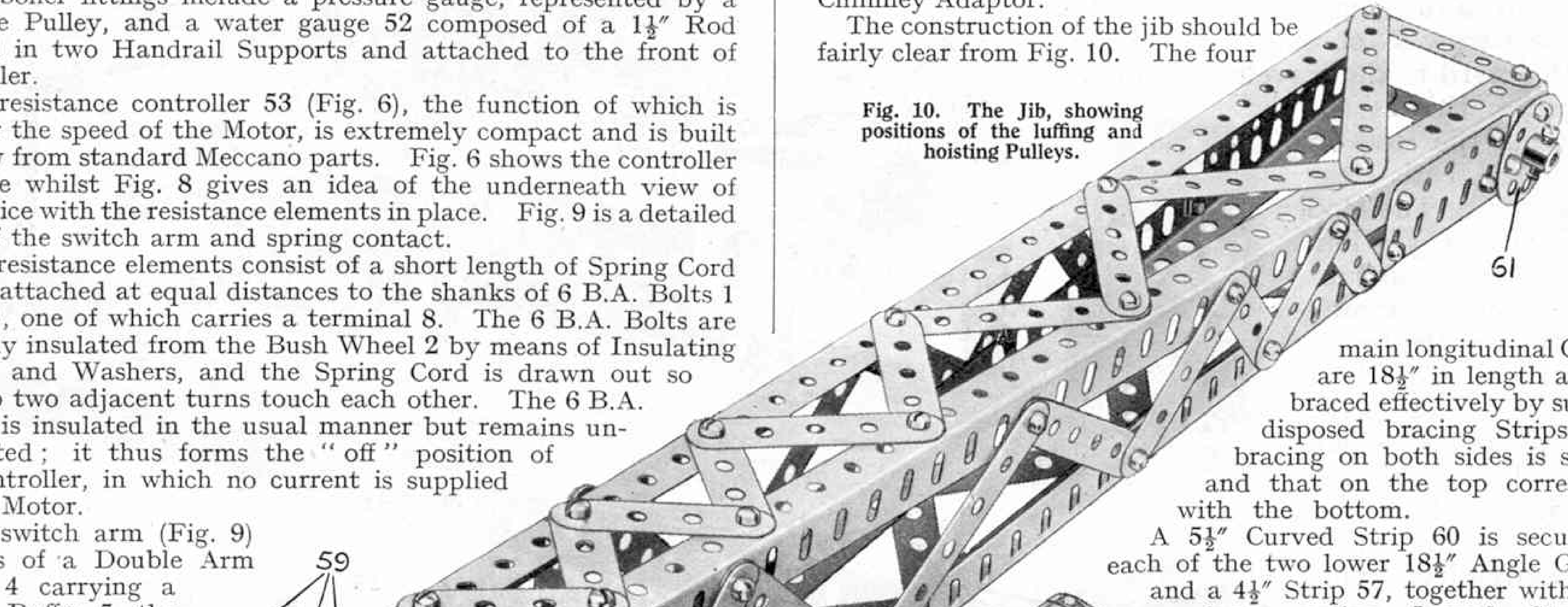


Fig. 10. The Jib, showing positions of the luffing and hoisting Pulleys.

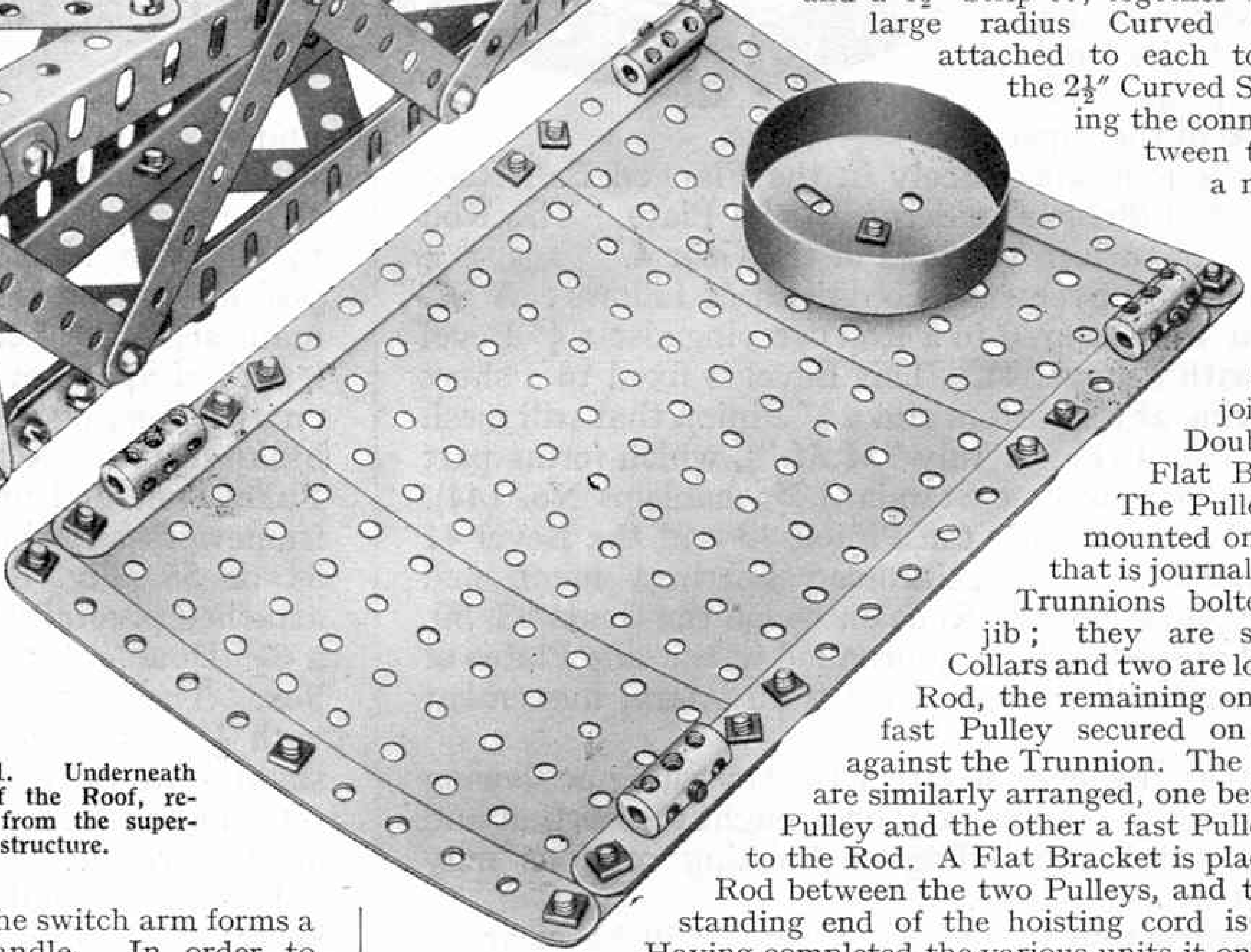


Fig. 11. Underneath view of the Roof, removed from the superstructure.

The resistance elements consist of a short length of Spring Cord that is attached at equal distances to the shanks of 6 B.A. Bolts 1 (Fig. 8), one of which carries a terminal 8. The 6 B.A. Bolts are carefully insulated from the Bush Wheel 2 by means of Insulating Bushes and Washers, and the Spring Cord is drawn out so that no two adjacent turns touch each other. The 6 B.A. Bolt 3 is insulated in the usual manner but remains unconnected; it thus forms the "off" position of the controller, in which no current is supplied to the Motor.

The switch arm (Fig. 9) consists of a Double Arm Crank 4 carrying a Spring Buffer 5, the head of which presses on the heads of the 6 B.A. Bolts forming the "contact studs"; thus smooth and efficient contact with the studs is assured. The Crank pivots on the top end of the supporting Rod 6 and is retained in position by the Collar 7. A Threaded Pin on the other extremity of the switch arm forms a convenient handle. In order to prevent the switch arm riding off the contact studs at either extremity of its travel, a stop consisting of the socket portion of a Spring Buffer, is secured to the Bush Wheel 2.

One of the Motor terminals is "earthed" to the frame of the model by connecting it to the bolt 56 (Fig. 6) by a short length of wire. The other terminal of the Motor is connected to the 6-volt Accumulator or Transformer by a length of wire, which passes out of the rear of the model. The other lead from the Accumulator is connected to the terminal 8 of the controller.

When the spring contact 5 (Fig. 9) of the switch arm is pressing on the "off" stud 3, no current is supplied to the Motor, of course. But when the switch arm is moved on to the next stud, the Motor commences to revolve at a slow rate of speed, due to the fact that the current has to flow through the entire resistance and that its value is therefore small. (Actually it is the voltage that is "dropped" or expended in the resistance. This causes the current to drop too, for voltage is the "driving force" or pressure forcing current through the resistance of a circuit).

On moving on to the next stud, one stage of the resistance is cut out and the speed of the Motor increases. Step by step, as more resistance is taken out, the speed of the Motor mounts up until the switch arm is on the last stud carrying the terminal 8, when all the resistance is cut out and a straight-through path is afforded for the current from the Accumulator to the Motor. The Motor now runs at its greatest speed and develops its maximum power.

The underside of the roof is shown in Fig. 11. It consists essentially of one 5½″ × 3½″ and two 5½″ × 2½″ Flat Plates, to the edges of which Strips are added for the purpose of stiffening. Four Couplings are secured by means of bolts to each corner of the roof to receive the top ends of the supporting Rods (Fig. 6). A Boiler End is secured to the underside of the roof by a single bolt, which also retains a Chimney Adaptor in place on the reverse side of the roof and a Sleeve Piece to represent a chimney is fitted over the Chimney Adaptor.

The construction of the jib should be fairly clear from Fig. 10. The four main longitudinal Girders are 18½″ in length and are braced effectively by suitably disposed bracing Strips. The bracing on both sides is similar, and that on the top corresponds with the bottom.

A 5½″ Curved Strip 60 is secured to each of the two lower 18½″ Angle Girders, and a 4½″ Strip 57, together with a 2½″ large radius Curved Strip, is attached to each top girder, the 2½″ Curved Strip forming the connection between the Girder and the Strip 57. The front ends of the Strips are joined by Double and Flat Brackets.

The Pulleys 59 are mounted on a 2″ Rod that is journalled in Flat Trunnions bolted to the jib; they are spaced by Collars and two are loose on the Rod, the remaining one, being a fast Pulley secured on the Rod against the Trunnion. The Pulleys 58 are similarly arranged, one being a loose Pulley and the other a fast Pulley secured to the Rod. A Flat Bracket is placed on the Rod between the two Pulleys, and to this the standing end of the hoisting cord is attached.

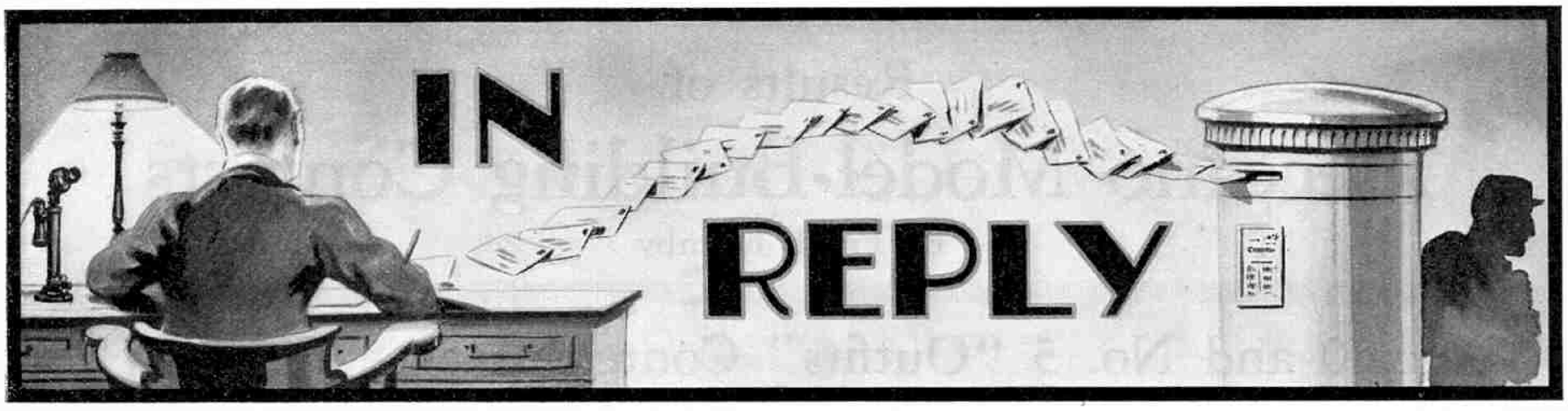
Having completed the various units it only remains to assemble them into a complete model. The swivelling superstructure is lowered into place over the central pivot (i.e., the Rod transmitting the drive to the travelling wheels) care being taken that the Ball Casing containing the balls is first placed in position on the 3½″ Gear 4 (Fig. 2, July "*M.M.*"), and that it registers correctly with the Flanged Ball Race which is bolted to the underside of the superstructure. It should also be seen that the ½″ Pinion on the lower end of the Rod carrying the Bevel 41 is meshing properly with the teeth of the Gear 4. The Pinion 17 (Fig. 5, July "*M.M.*") may now be secured to its Rod.

The jib pivot pin—a 4½″ Rod—is passed through the 2½″ Triangular Plates 27 (Fig. 6) and through the bosses of the Bush Wheels 61 (Fig. 10) that are secured to the foot of the jib.

One end of the luffing cord is attached to the head of the jib and passed over one of the Pulleys 29 (Fig. 6). It is then taken over a Pulley 59 at the jib head and back over the remaining Pulley 29. Thence it is led over the other Pulley 59 at the jib head and down to the luffing winch barrel, on which it is secured.

The hoisting cord is secured to a Flat Bracket on the Rod carrying the Pulleys 58 and passed round one of the sheaves of the two sheave Pulley Block. Next it passes over one of the Pulleys 58, round the remaining sheave of the Block, over the other Pulley 58, over the centre Pulley 59, and so down to the hoisting barrel.

Finally the roof may be placed in position by fitting the Boiler End on to the Boiler and securing the ends of the Rods 26 in the centre transverse bores of the Couplings that are secured to the underside of the roof.



READERS' SUGGESTIONS FOR MECCANO IMPROVEMENTS

SPECIAL LETTERING.—A range of small letters and figures that could be secured to Meccano models would be a useful addition. Such models as locomotives, and tenders, and motor cars, require the addition of the correct serial numbers and letters to provide the finishing touch, and these special letters would be very handy for these models. We have had before us for some time a suggestion for letters and figures transferred on to small tin plates, which would be held in place by dredger bucket clips. We shall consider your idea along with this one. (*Reply to R. Place, Leeds*).

SPOKED WHEELS.—Readers continue to suggest the introduction of wire spoked wheels in 2 in. dia. and 3 in. dia. sizes. These wheels would look very realistic and, as the great majority of cars are now fitted with some type of wire wheels, models incorporating such wheels would be up to date. The difficulty lies in the cost of manufacturing miniature spoked wheels. We shall keep the idea before us, however. (*Reply to R. M. Rippin, Guernsey, C.I.; F. Johnston, Stoke; and others*).

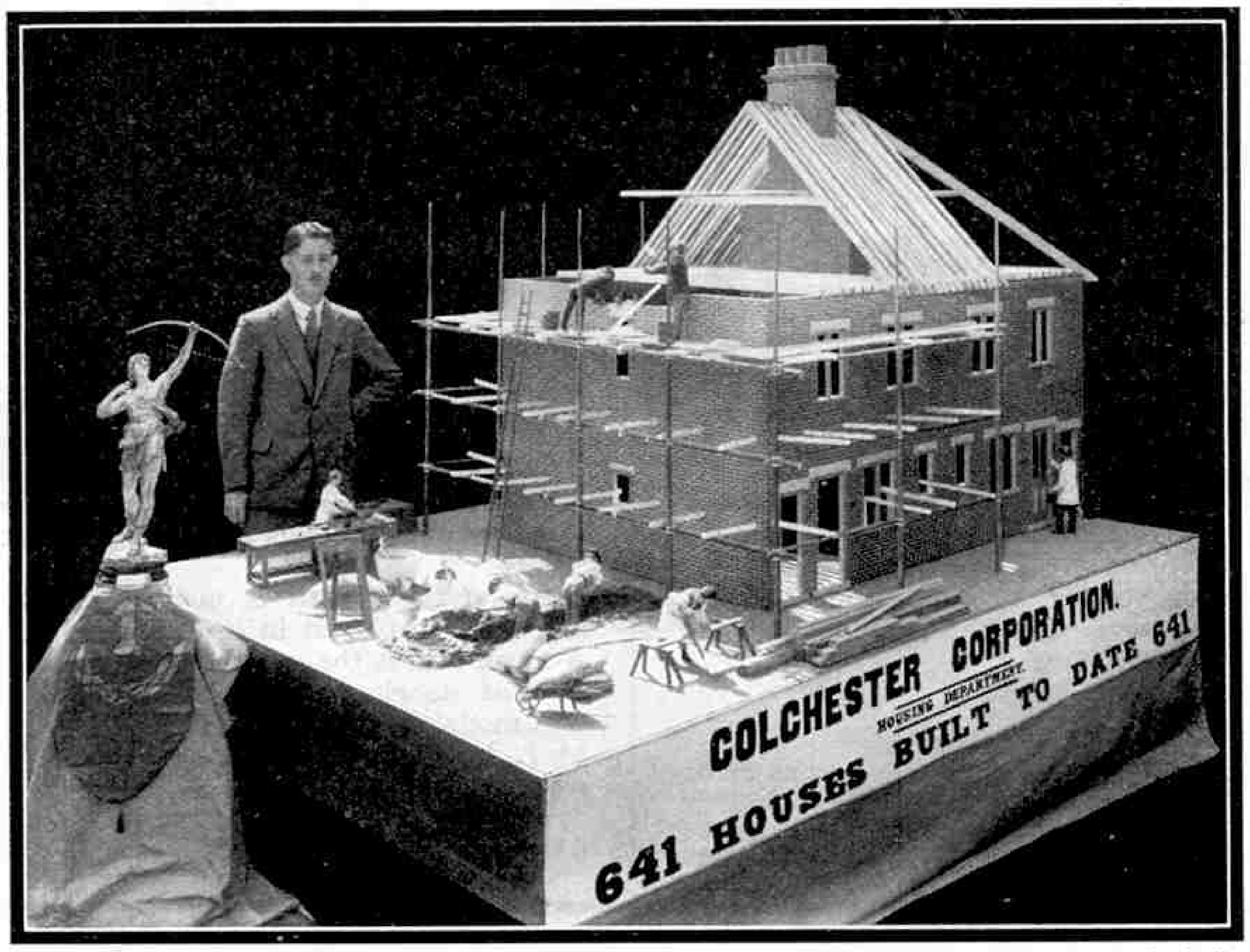
WOODEN SLEEPERS.—Sleepers for use with the Meccano Angle Girders, Strips, etc., in the construction of model railway track would form interesting additions, but as it is not possible to reproduce the correct rail section by means of Meccano parts, it is doubtful whether it would be worth while to introduce such sleepers. Realistic sleepers can at present be made from two Angle Girders bolted together to form an inverted U-section girder. (*Reply to J. Blackie, Bonnyrigg*).

SPECIAL SMALL CAM.—A small cam might be of use in the construction of demonstration models of internal combustion engines, automatic machines and similar mechanisms, and we have examined with interest your proposed design. The drawback to the introduction of a small cam into the Meccano system is that most models require a cam having a "stroke" of special length, and it is not possible to devise a cam that would have a universal application. In any case we cannot consider the introduction of a special roller end piece for the tappet rod for use with the proposed cam, as a small Fork Piece fitted with a ½" loose pulley will serve excellently for this purpose. (*Reply to I. P. MacDougall, Blackburn*).

RATCHET STRIP.—An accessory resembling an angle girder, but with ratchet teeth cut in one of its flanges, would no doubt be useful. The part could be employed when it was required to lock a lever in any desired position, the strip or rod forming the lever being held against the ratchet teeth by means of a spring, and adjusted as required. It is possible to construct a mechanism of this type using the Meccano Rack Strips (see the gear control of the model Mobile Crane, Super Model No. 20). (*Reply to F. Munro, Sheffield*).

HEAVY SPROCKET CHAIN.—Sprocket chain built up from pressed steel links and steel connecting pins would be very strong. The introduction of this special chain would necessitate adding a range of special wheels, and we are not prepared to do this at present. (*Reply to J. A. Silverton, Cape Town*).

AN INTERESTING SCALE MODEL HOUSE



This interesting model house formed an attractive exhibit during Civic Week at Colchester. It is built to a scale of 2 in. to 1 ft. The nine workmen seen in the illustration are operated by mechanism constructed from Meccano parts, each figure being connected by catgut with a system of cranks incorporated in the base and driven by an Electric Motor. When in motion the model is most interesting to watch, for each of the workmen is shown in realistic action at his appointed task. The model was in operation continuously throughout the whole week, and no mechanical breakdowns occurred, which speaks well for the strength of the Meccano mechanism. We are indebted for our photograph to Mr. C. A. Ellis, Colchester.

135° ANGLE BRACKET.—Your design for a special bracket for connecting strips, girders, etc., at an angle of 135°, is interesting, but we do not consider that special brackets of this type are necessary, as the existing ½" and 1" Angle Brackets can easily be bent to the required angle. Girders and other parts cannot be so easily formed, but they are very rarely required in model-building. In certain cases it is permissible to bend standard Strips to the required angle, but care should be taken not to damage the enamel. (*Reply to A. Denby, Sheffield*).

SMALL HINGES.—A small and neat hinge such as you suggest for use where the existing Hinge (part No. 114) is too large, has points of interest. The lugs of the proposed hinge would carry threaded shanks, by means of which the hinge could be attached to the door, etc. An interesting form of hinge construction was described in the December, 1927, "Suggestions Section." (See S.M. 281). (*Reply to J. A. Rodriguez, Montreal*).

The best suggestion for a new or improved Meccano part sent in during the month of June was submitted by G. Hunter, Edinburgh, and the monthly prize of 10/– has therefore been awarded to him. The winning idea was for a new type of spanner that would have considerable utility.

DRIVING WHEELS.—Your proposal that the large Hornby cast driving wheel should be supplied complete with standard Meccano size boss and set-screw, has possibilities. The existing wheels are suitable for most purposes. (*Reply to T. Stevens, London, S.W.18*).

RUBBER BUSHES.—We were interested in your suggestion that the Meccano Insulating Bushes (electrical part No. 302) should be made from resilient rubber. Bushes prepared from this material could be used in the construction of models in which it was required to insulate one portion against vibration. They might also be used in building up "oleo" legs for model aeroplanes. Recently we have been carrying out experiments in regard to the more extensive use of rubber in the Meccano system, and we hope to give your suggestion further consideration. (*Reply to M. Lewis, Aberystwyth*).

SPECIAL ANGLE STRIP.—An angle strip having a number of notches or slots cut in it in place of the standard perforations would form a novel unit. The chief use of this part would be as the gear rack of a model gear-box. The gear shift lever would be moved into each of the notches in turn, the movement of the lower end of the gear lever causing the corresponding gears to be engaged. This idea has possibilities, but we must point out that an efficient notched quadrant can be formed from existing Meccano parts. A Meccano 2½" Curved Strip is used for the quadrant, while the lever consists of a Strip fitted with one of the latest pattern round headed bolts. The domed head of the bolt fits into the slots and holes in the Curved Strip, and the required gear positions are thus provided. Examples of the use of this form of gear quadrant will be found in the Mechanical Excavator (Super Model No. 19a) and the Railway Breakdown Crane (Super Model No. 30). (*Reply to G. Byford, Catford, S.E.6*).

BADGE FOR MODEL BUILDERS.—A silver or rolled gold tiepin engraved with the words "Meccano" or "Meccano Engineer" would look attractive and might be popular with some model builders. The best badge is of course the Meccano Guild badge. By wearing this, you show not only that you are a model engineer, but also that you are a member of the world-wide fellowship of Meccano boys. (*Reply to G. N. Kasthuri, Kuala Lampur, Malay States*).

A NOVEL SCREWDRIVER.—Your design for a screwdriver that automatically grips the bolt is ingenious. This feature would be obtained by cutting two narrow slots in the blade for a short distance near the tip. The centre prong of the "three-prong" blade thus formed would be sprung outward slightly and the complete tip would be tempered to render it springy. In action, the three prongs would be held together and inserted into the slot or saw-gate of the bolt. On releasing the pressure the prongs would grip the sides of the slot and hold the bolt in place, so that it could be inserted in an intricate portion of a model. We are considering the practical possibilities of the idea. (*Reply to R. R. Pearce, Bristol*).

RIGHT-ANGLE ROD.—If certain of the standard Rods were also supplied bent at right angles several uses could no doubt be found for them. They would be useful for instance in the construction of crank-shafts, and they would be neat and efficient. We shall consider this idea. (*Reply to J. Gourley, Londonderry*).

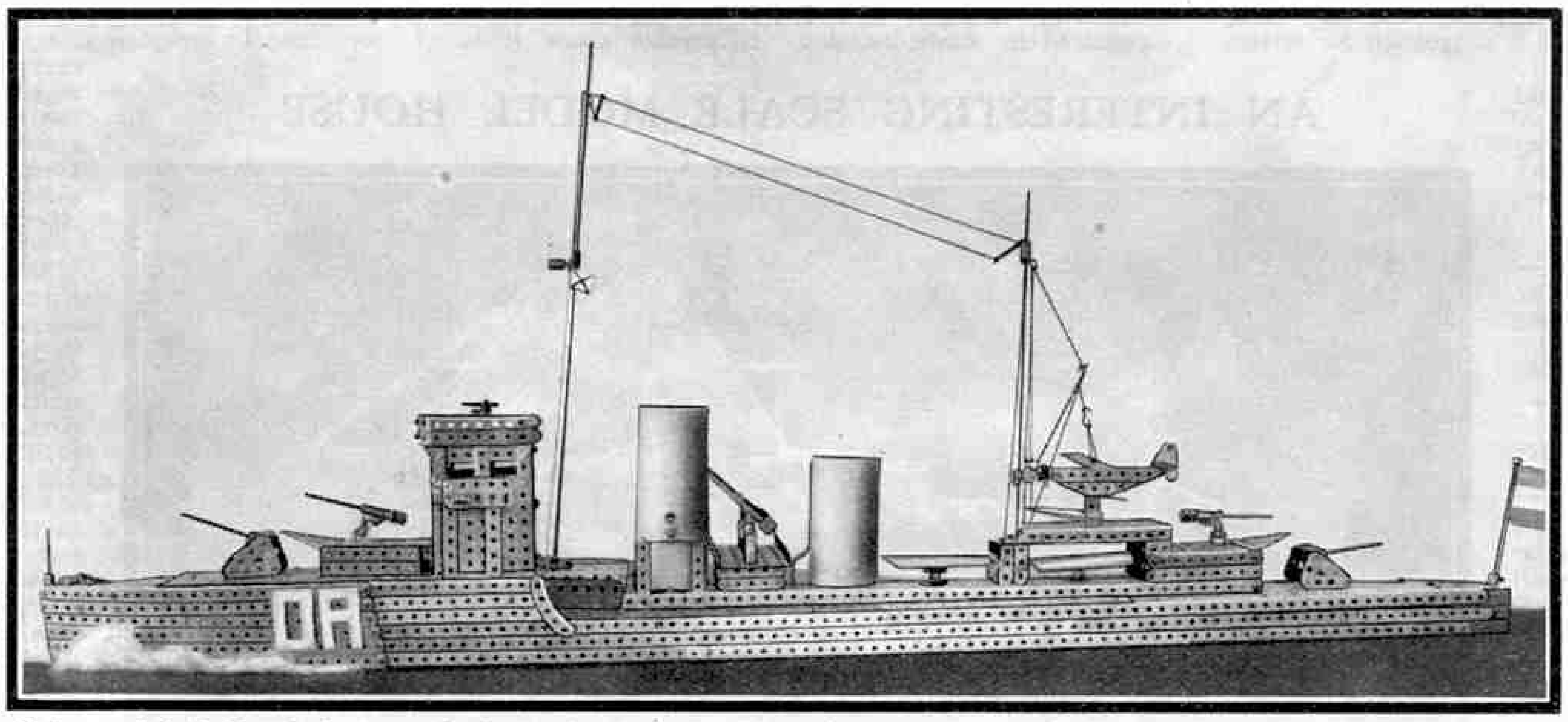
Results of Meccano Model-Building Contests

By Frank Hornby

No. 0 and No. 5 "Outfits" Contest (Home Sections)

It is interesting to note from letters received from competitors in the "Outfit" Contests, that many Meccano boys who are in possession of quite large Outfits obtain infinite pleasure from building up simple structures for entering in the sections devoted to the smaller models. In the larger Outfit sections, on the other hand, competitors are able to extend their activities considerably and to indulge in constructional methods that are possible only to those who have a good assortment of parts at their disposal.

Although neither section of this Contest produced any particularly outstanding models, the majority of those submitted are well built, and make good use of the contents of the respective Outfits. The task of allotting the various prizes was much easier than is usual in Meccano Contests, however, owing to the decided superiority of the models that were finally chosen as the prize-winners.


A fine model of a Dutch destroyer, by J. van der Ploeg, Holland, who won a prize in the Overseas Section of the "Christmas" Model-building Contest.

The prizes have been awarded as follows:—

Section A (for models built from No. 0 Outfits).

First Prize, Meccano goods value £2-2s.: J. Holland, Wembley. Second Prize, Meccano goods value £1-1s.: H. H. Miles, Southampton. Third Prize, Meccano goods value 10/6: L. Marchant, London, S.W.20.

Six Prizes of Meccano No. 0a Outfits: A. Peacock, Soham, near Ely; E. Parvin, Selby; A. Ringrose, Limerick, Ireland; C. M. Dunlop, Aberdeen; S. Noad, Gloucester; B. Rivron, Ipswich.

Six Prizes of Meccano Engineer's Pocket Books: B. Kiernan, Drogheda, Co. Louth; H. Webb, London, N.22; W. E. Rudd, Dublin; R. Wheldon, Fawdon, Newcastle-on-Tyne; R. Talbot, Wilburton, near Ely; S. R. Chapman, Rugby.

Section B (for models built from No. 5 Outfits).

First Prize, cheque value £3-3s.: J. H. Houghton, Cheltenham. Second Prize, cheque value £2-2s.: J. E. Ford, Birdbrook, Essex. Third Prize, cheque value £1-1s.: H. Smith, Clewer, Windsor, Berks.

Six Prizes of Meccano goods value 10/6: C. Greener, Maghull, Liverpool; E. Leech, Ashton-u-Lyne; J. Morris, Chatham; P. Neave, Norwich; T. Woodcock, Folkestone; L. Hollyoak, Coventry.

Six Prizes of Meccano goods value 5/-: N. R. Archer, Dover; N. Kent, London, N.1; D. A. Dutton, Penylan, Cardiff; M. McDonald, Ranelagh, Dublin; A. Figgett, Chatham; W. J. R. Peacock, Cheltenham.

Twelve Prizes of Meccano Engineer's Pocket Books: R. Cooke, Norwich, Norfolk; G. Taylor, Nottingham, Notts.; G. Patterson, Crumpsall, Manchester; R. Mills, Nailsworth, near Stroud; F. R. Taylor, Studley Priory, near Oxford; C. N. Marston, Halifax; D. Limpus, Belle Vue, near Penryn; E. Scott Wakefield; M. Mainwarring, Ellesmere, Shropshire; A. Upson, Pinner, Middlesex; D. Brooks, Alveston, near Bristol; E. Appleby, Liverpool.

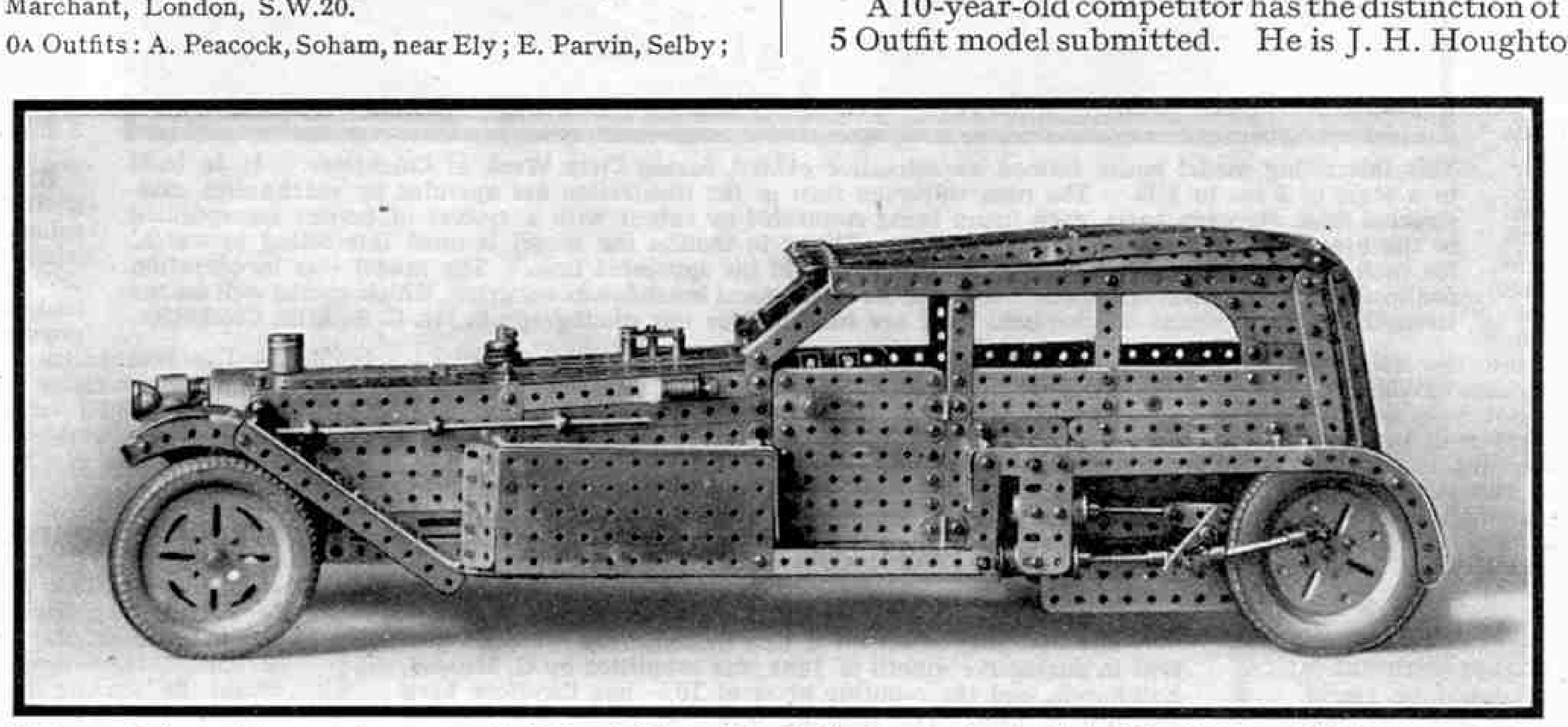
There have been occasions in past Meccano Competitions when all the principal awards have gone to competitors residing in the north of England, but in this Contest Cheltenham and Birdbrook were the farthest north for the chief awards to reach. The consolation prizes are more evenly distributed, however, and are shared by competitors living in all parts of the British Isles.

Many large models were sent, but lack of originality placed these at a disadvantage with smaller, but more original efforts.

The racing car that secured First Prize in Section A for John Holland is a good, I almost said perfect, example of what can be done with very few parts. The shape of the chassis is not all that could be desired, but the ingenuity displayed in its construction is worthy of mention. A novel idea is the use of an Angle Bracket bolted to the bonnet so that its elongated hole forms the "sight."

A model oil tanker by H. H. Miles, and an aeroplane roundabout by L. Marchant, secured the Second and Third Prizes in Section A respectively.

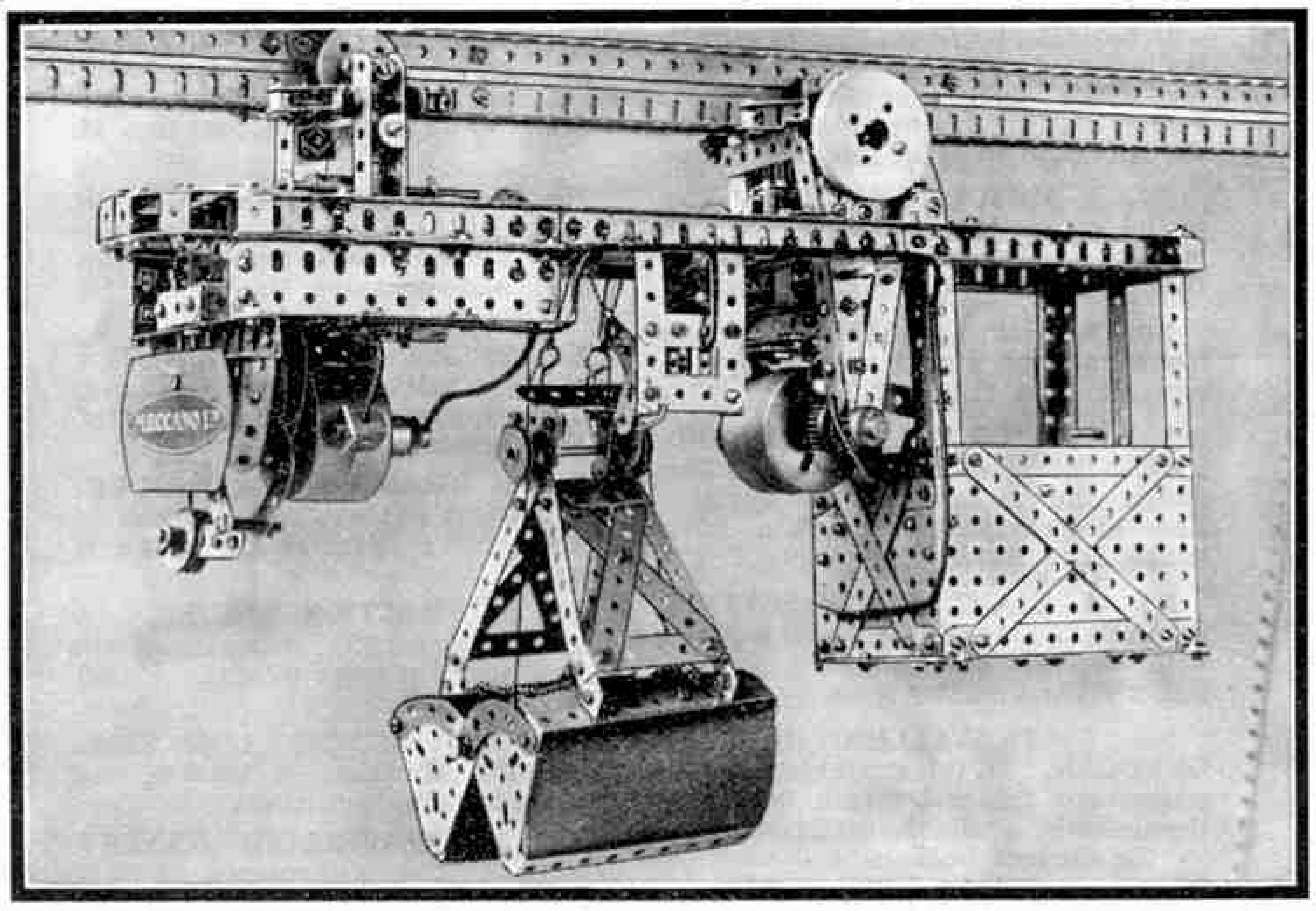
A 10-year-old competitor has the distinction of building the best No. 5 Outfit model submitted. He is J. H. Houghton, and his model is a lorry and trailer. I have described models of this type on this page so many times previously that I do not propose now to go into details of Houghton's model.


This novel steam-driven auto-car was built by J. Ringnalda, Holland. Owing to their hill-climbing abilities, cars of this type are useful in mountainous districts.

A racing car took Second Prize for J. E. Ford, and Third Prize was awarded for a model of the Parnall Peto seaplane sent in by H. Smith. The appearance of the seaplane is spoilt by the propeller, which unfortunately is decidedly out of proportion to the remainder of the model. The floats are made from $5\frac{1}{2}''$ Strips, rounded off at the front of the machine by means of Curved Strips. The engine is represented by a Bush Wheel, in the boss of which the propeller shaft is journalled. Although there is nothing particularly outstanding about the model it is a good example of what can be done with a specified selection of parts, and by using smaller Strips for the propeller, Smith could have considerably improved the appearance of the model.

More Details of Prize-winning Models in the "Christmas" Contest

In the July "*M.M.*", I described the principal prize-winning models in the Overseas Section of this Contest, and this month I have pleasure in dealing with some of the other outstanding entries. Even after these two articles, however, there will still remain a large number of really interesting models that I should like to describe and illustrate if I had sufficient space. As it is impossible to deal with all of them, however, I have picked out those that I think will interest the majority of readers.

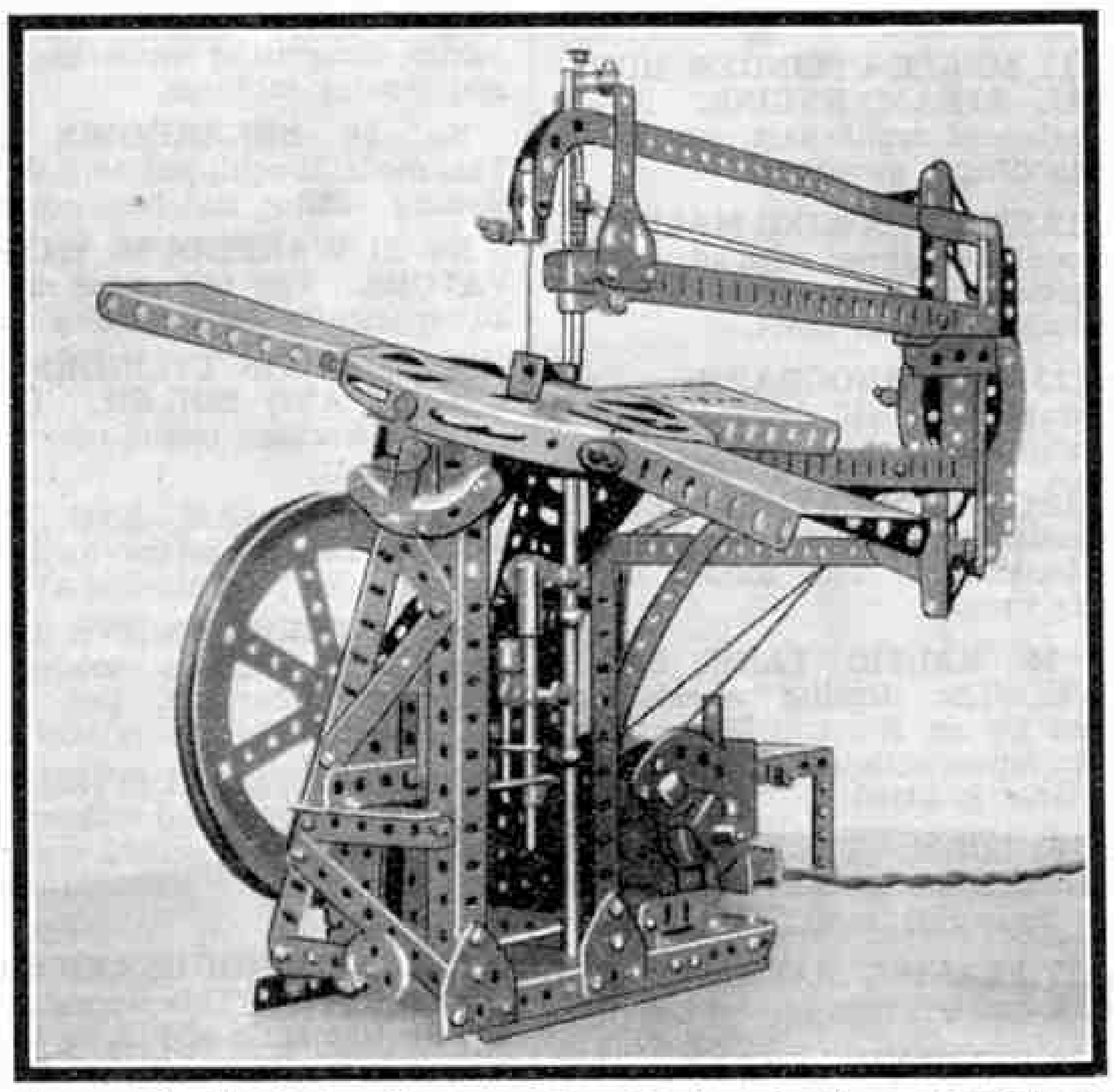

An electrically-operated trolley hoist, by J. Ringnalda.

Models of architectural subjects are not common among competition entries, and this fact adds interest to the model of a Canadian railway station that was submitted by J. A. Rodriguez, of Montreal. The structure represents a main line terminal station, and with the exception of a clock over the entrance to the booking hall, and the roof, is constructed entirely from Meccano parts. Ticket, tobacco, and confectionery booths, are provided in the entrance lobby, and there is also a lift to convey passengers to the second floor, where various compartments such as waiting rooms and offices are to be found.

It will be realised that the roofing of such a large model would necessitate the use of an enormous number of Meccano parts, and as these were not available Rodriguez was compelled to use cardboard, laid on over a skeleton framework of Girders and Strips.

In the photographs submitted, which I regret are not clear enough for reproduction, four trains are to be seen standing at the platforms, and dozens of miniature "people" scattered judiciously about the station, give the atmosphere of activity that is always associated with a real railway terminus.

One of the accompanying illustrations shows an electric trolley hoist, which won a prize for J. Ringnalda. This model is remarkable for the neatness of the work and the good use that is made of the various Meccano parts incorporated. Ringnalda is responsible also for the construction of the novel steam-driven motor car, also illustrated here. Apart from the cylinders, which drive direct on to the rear wheels, its external appearance does not differ very much from that of an ordinary automobile. The "boiler" is hidden under the bonnet, on top of which a realistic Ramsbottom type safety-valve is fitted. The fuel is carried in bunkers on the running boards. A point that will appeal to model-builders who appreciate the finer details of model construction is the use of a Pawl to represent the familiar pattern door-handle! Ringnalda says that actual cars of this type are for use in mountain districts like Switzerland.


A remarkable fret-cutting machine that embodies a wealth of ingenious detail-work. It won a prize in the "Christmas" Contest for D. R. Heeramaneck, Bombay.

Another model of interest is an electrically-operated travelling transporter or mobile crane, the prototype of which was illustrated on page 203 in the "*M.M.*" for March 1929. It was built by N. E. Hodson, and has three movements, hoisting, slewing and travelling, each of which is controlled from a single lever.

A Canadian boy, J. G. Horn, submitted a very pleasing model of a petrol-engined locomotive crane. It represents an actual machine of 25 tons capacity, and in accordance with the prototype possesses four separate motions, which in the model are motor driven. Double winding-drums are fitted for raising the boom. One end of the hoisting cable is tied to one of the drums, and is then led upward and over a Pulley on the roof of the cab. Then it passes over a ½″ Pulley at the end of the boom, back and round a second Pulley on the cab roof, over a second Pulley at the boom head, over another Pulley on the cab roof, and finally is attached to the other winding drum.

A separate drum is fitted for hoisting the load and is equipped with a quick-acting brake, which consists of a 1″ fast Pulley mounted on the winding-drum shaft and fitted with a Rubber Ring, against which a short Strip can be brought to bear in order to prevent the shaft from rotating.

A very fine model was sent by V. Noguera. It is a reproduction of the Argentine school frigate "*Fragata Sarmiento,*" and is a very worthy attempt to reproduce a difficult subject. When first I picked up the photographs of the model, it was some time before I realised that it really was a Meccano model! It is 5 ft. in length, 3 ft. in height, and 10 in. in width!

The masts are built from Meccano Rods joined together with Couplings. The deck fittings include a winch for lifting the anchor; two realistic skylights built from Windmill Sails and Double Angle Strips; a searchlight and a wireless telegraph room. Six life-boats are mounted, three on the port side and three on the starboard side; and a steering wheel and binnacle are placed in the stern. The fine appearance of the model is due to the maze of rigging and the neatness of the ratlines, however, the arrangement of which must have entailed a tremendous amount of work. When the model is viewed in a darkened room, with its masthead and port and starboard lights aglow, the effect must be very fine indeed. Current for the lights is provided by a 4-volt battery hidden in the hull. The ship was built from photographs published in various magazines and newspapers.

Model battleships are always present in Meccano competitions, and the one illustrated here is a good example of the fine work that can be done in this direction. The model referred to was built by J. van der Ploeg, and is a copy of one of eight destroyers built between 1926 and 1930 for the Dutch Royal Navy. As far as possible it is built to scale, its length being 5 ft. and its maximum width 5½ in. The foremast is 2 ft. in height. With the exception of the funnels, torpedo tubes, class letters and flags, the model is made from standard Meccano parts. Particularly good work has been done on the bridge superstructure, and in the details of the deck fittings, which it will be seen include a special runway for launching a seaplane.

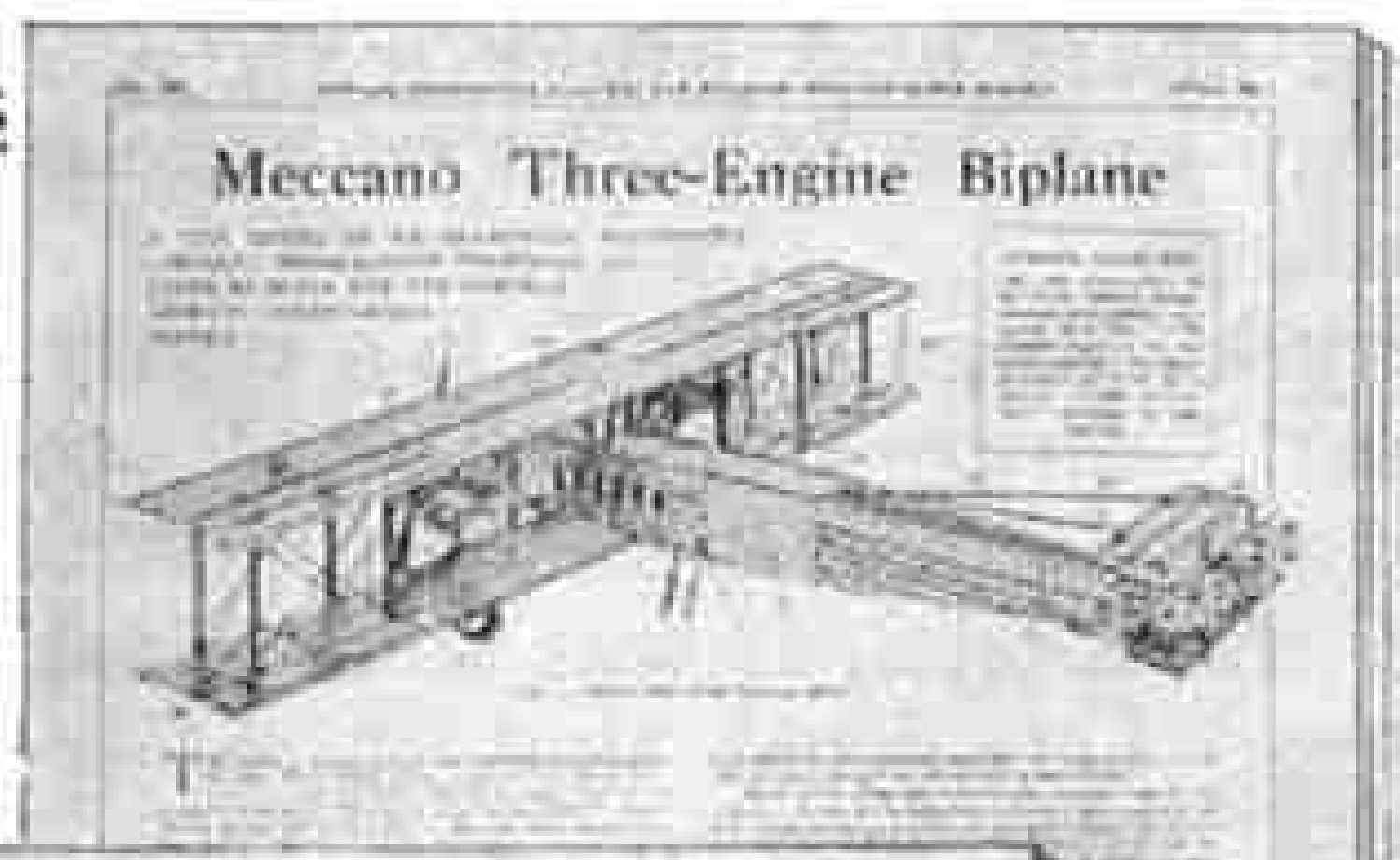
A fret-work machine, by D. R. Heeramaneck, is perhaps one of the most ingenious models entered in this Contest. Not only is it capable of cutting through wood up to 3/16 in. thick, but also it embodies all the essential features of the well-known Hobbies machines, including an adjustable table and tilting wings that enable Anto-fret cutting to be done. The saw frame is built from Angle Girders and is tensioned by means of a specially-designed mechanism, a few details of which can be seen in the illustration. One of the refinements with which the model is fitted is a lay-shaft that carries sand-papering and buffing wheels.

A. F. Russell sent an interesting model of a three-stamp battery, of the type used for breaking ore in Rhodesian gold mines.

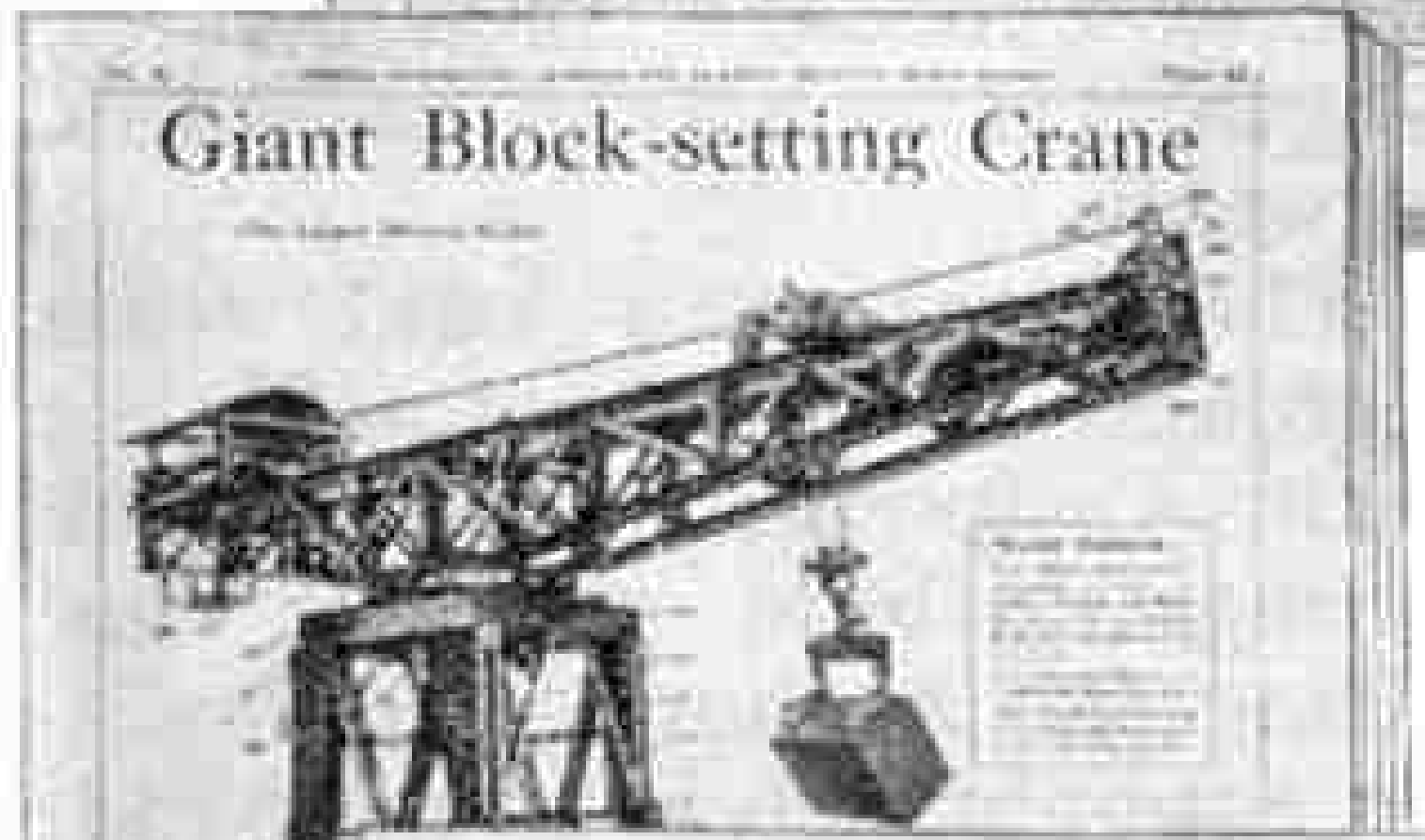
A "Keystone" well driller won a prize for Jan Hers. Essentially the machine consists of a crank mechanism by means of which a heavy "bit," suspended on a cable attached to a winding drum, can be hauled to a height and then dropped on to the rock with great force. Repeated strokes gradually bore a hole in the rock.

Another entry is an electric bucket dredger of the gantry type, as used at Yallourn, Victoria, Australia, for excavating coal. It was built by G. R. Nisbet, and travels over two transport tracks so that the coal may be discharged into trucks standing on either track, by altering the position of a chute.

MECCANO SUPER MODELS


Meccano Three-Engine Biplane

Leaflet No. 34


Giant Block-setting Crane

Leaflet No. 4

New Meccano Motor Chassis

Leaflet No. 1

Meccano Giant Dragline

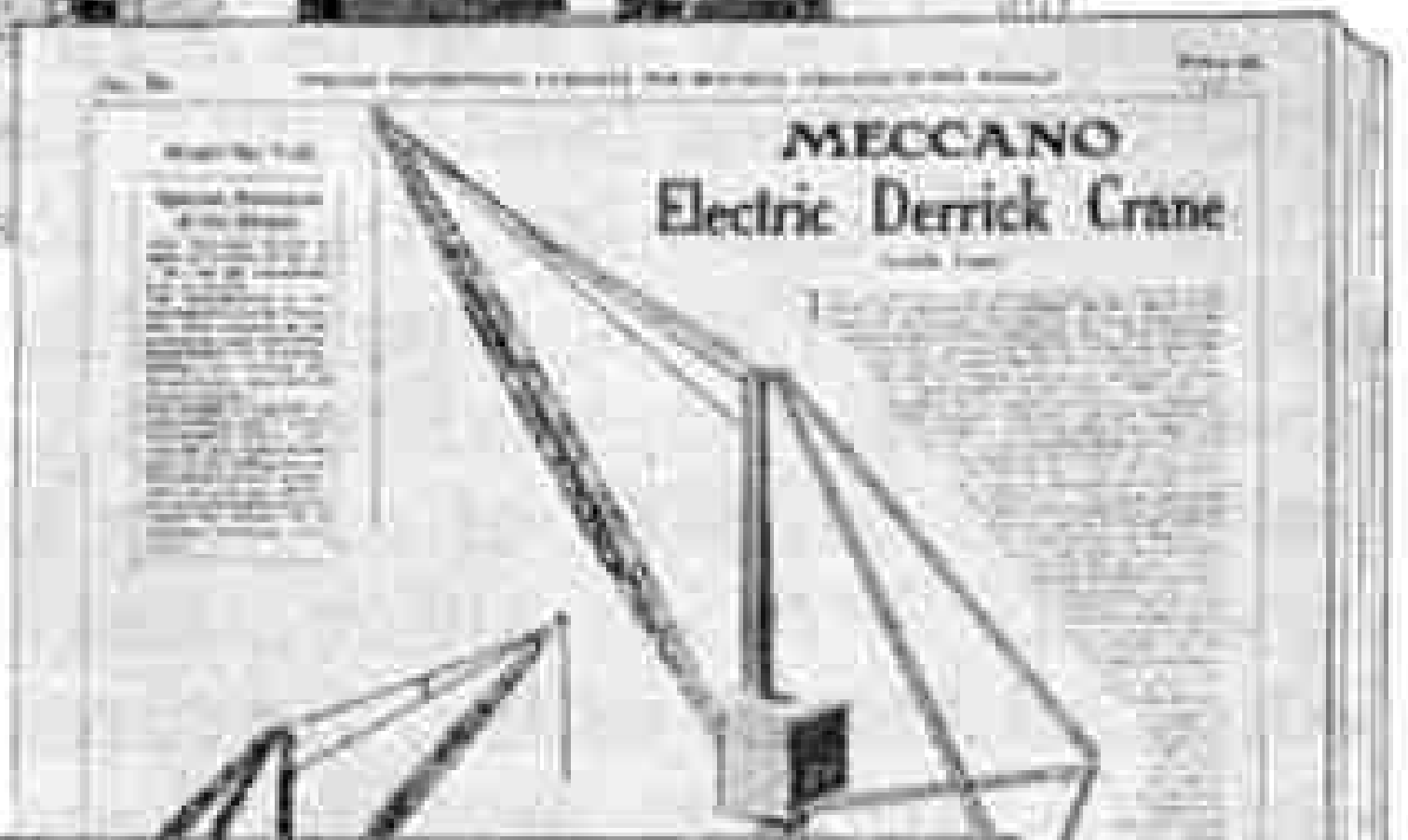
Leaflet No. 27

Baltic Tank Locomotive

Leaflet No. 15

Electric Mobile Crane

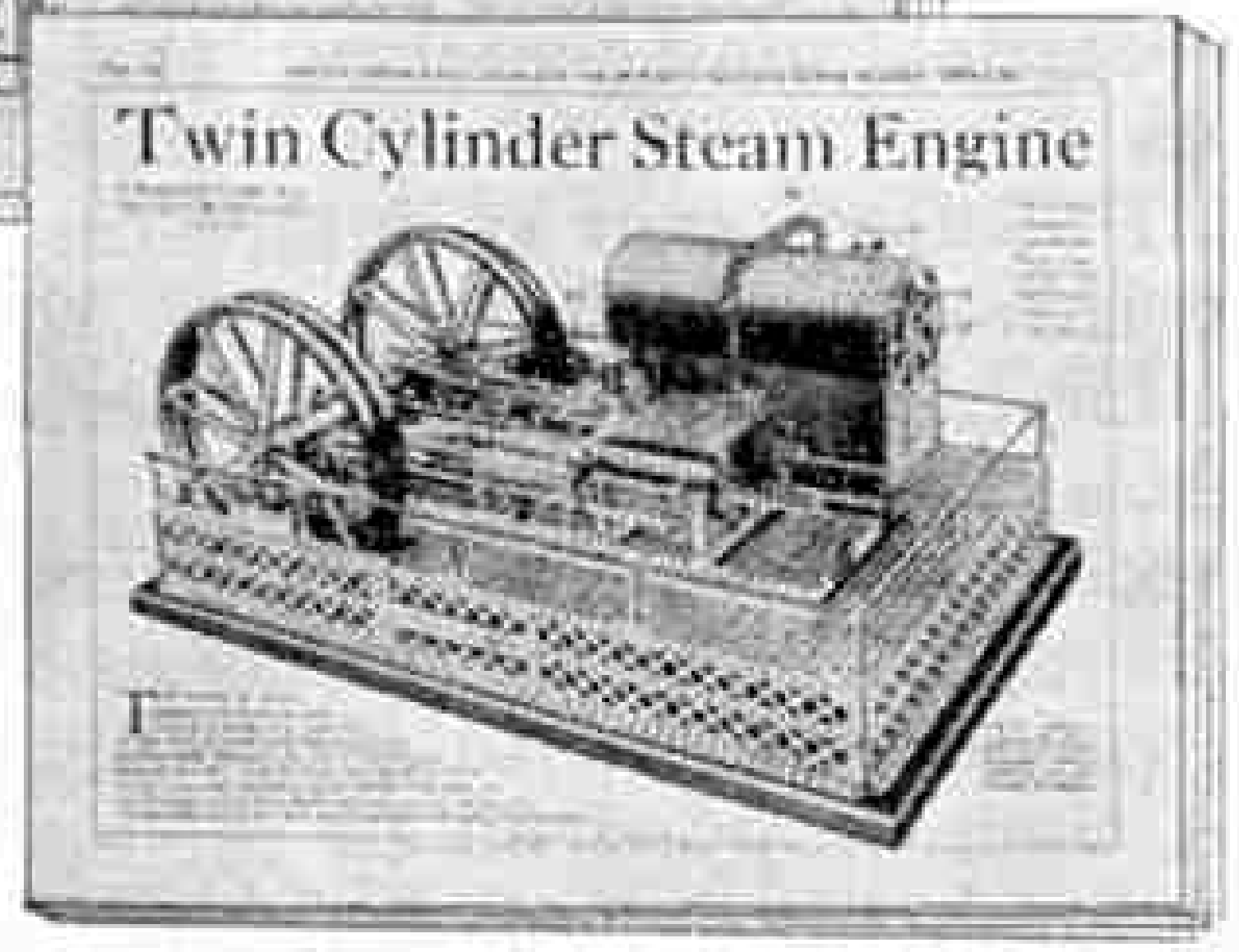
Leaflet No. 20


MECCANO Electric Derrick Crane

Leaflet No. 36

Meccano Grandfather Clock

Leaflet No. 14a


Twin Cylinder Steam Engine

Leaflet No. 32

INSTRUCTION LEAFLETS

Our expert designers have produced for us 39 super models that reach the highest pinnacle ever attained in Meccano construction. Each model in this series is a masterpiece and there is not a boy who will not be eager to build them all.

These models are so important that we have published a special leaflet with beautiful half-tone illustrations for each of them. A selection of the leaflets is illustrated on this page.

A brief description of each model in the series is given below. Copies of the leaflets may be obtained from any Meccano dealer or direct from us, post free, at the prices shown at the foot of the page.

No. 1 MOTOR CHASSIS. This model runs perfectly under its own power. It has Ackermann Steering, Differential, Gear Box and Clutch, etc.

No. 2 SHIP COALER. All the movements of a real ship-coaler are reproduced in this model.

No. 3 MOTOR-CYCLE AND SIDE-CAR. The sidecar is of stream-line design and is mounted on springs. The motorcycle is complete with lamps, horn, exhaust pipes, etc.

No. 4 GIANT BLOCK-SETTING CRANE. This realistic model is fitted with an accurate reproduction of Fidler's block-setting gear.

No. 5 TRAVELLING BUCKET DREDGER. In this model trucks and wagons can run underneath the chute through which falls the material raised by the dredger buckets.

No. 6 STIFF-LEG DERRICK. This model has many interesting movements, including hoisting, luffing and swivelling, which are controlled by suitable levers.

No. 7 PLATFORM SCALES. This model will weigh articles up to 4$\frac{1}{2}$ lb. with remarkable accuracy.

No. 8 ROUNDABOUT. This model is most attractive when in motion. As the roundabout rotates the cars spin round and the horses rise and fall.

No. 9 BAGATELLE TABLE. This is an interesting model that will give hours of fun to the players.

No. 10 LOG SAW. In this model the saw is driven rapidly to and fro while the work table travels beneath it.

No. 11 SINGLE-CYLINDER HORIZONTAL STEAM ENGINE. Fitted with balanced crankshaft, crosshead, and centrifugal governor.

No. 12 STONE SAWING MACHINE. The model is equipped with adjustable work table and overhead trolley with self-sustaining chain hoist.

No. 13 MECCANOGRAPH. This wonderful model will draw hundreds of beautiful designs.

No. 14a GRANDFATHER CLOCK. A practical example of Meccano model-building. The model keeps accurate time.

No. 15 BALTIC TANK LOCOMOTIVE. The driving wheels are operated by an Electric Motor. An accurate reproduction of Walschaerts' Valve Gear is fitted.

No. 16a LOOM. This is perhaps the greatest Meccano success. The model weaves beautiful material.

No. 17 PLANING MACHINE. Fitted with quick-return motion.

No. 18 REVOLVING CRANE. This model is fitted with screw-operated luffing gear.

No. 19 STEAM SHOVEL. This model embodies travelling, rotating, racking and digging movements, and jib hoisting and lowering gear.

No. 19a STEAM EXCAVATOR, OR MECHANICAL DIGGER. A Meccano Steam Engine is incorporated in this model and provides the power for operating the four movements.

No. 20 MOBILE CRANE. This model has hoisting, luffing, travelling and slewing movements. It is fitted with an automatic brake.

No. 21 TRANSPORTER BRIDGE. The carriage automatically travels to and fro for as long as the motor is driven.

No. 22 TRACTION ENGINE. A remarkably realistic model that will pull a boy of average weight. Fitted with two speeds.

No. 23 VERTICAL LOG SAW. While the saws are in motion, the logs are fed slowly to them.

No. 24 TRAVELLING GANTRY CRANE. The movements of this model comprise the traversing of the entire gantry, hoisting and lowering, and the traversing of the crane trolley.

No. 25 HYDRAULIC CRANE The hydraulic ram is represented realistically by a powerful screw mechanism.

No. 26 TWIN ELLIPTIC HARMONOGRAPH. Some beautiful designs may be produced with this model.

No. 27 DRAGLINE. This imposing model of a giant excavator is fitted with travelling, luffing, slewing, and dragging movements.

No. 28 PONTOON CRANE. The movements of this model include the operation of the two hoisting blocks, slewing of the entire crane and luffing.

No. 29 HAMMERHEAD CRANE. This is a very realistic and powerful model, comprising traversing, hoisting and slewing motions.

No. 30 BREAKDOWN CRANE. This model is equipped with travelling, slewing, luffing, and hoisting motions.

No. 31 WAREHOUSE WITH ELEVATORS. The two cages are driven automatically and work alternately.

No. 32 TWIN CYLINDER STEAM ENGINE AND BOILER. This is a realistic working model of a complete steam plant.

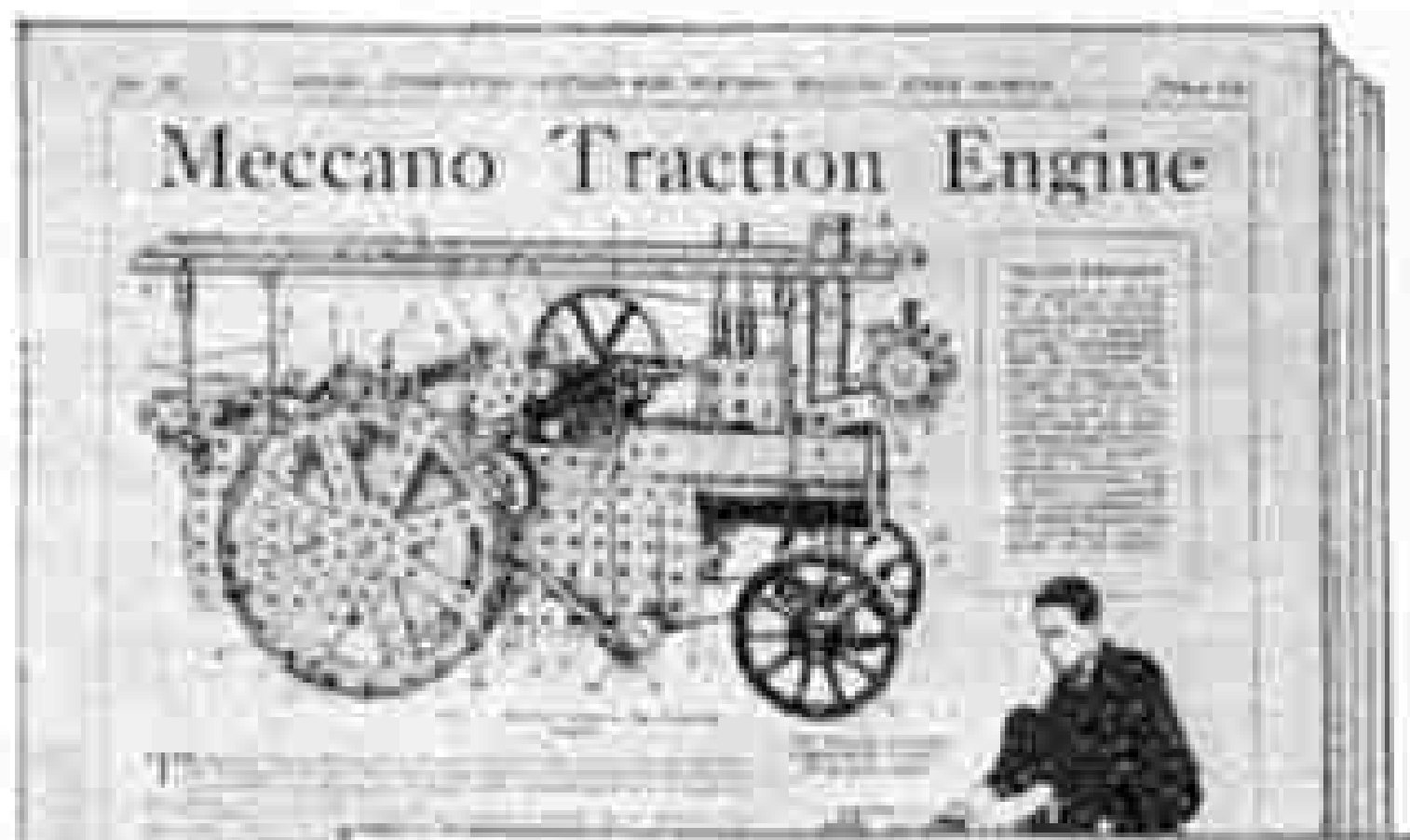
No. 33 SINGLE AND DOUBLE FLYBOATS. These two models represent popular pleasure-fair attractions.

No. 34 THREE-ENGINE BIPLANE. This is a realistic model of an "Argosy" machine, and is fitted with ailerons, elevators and rudders.

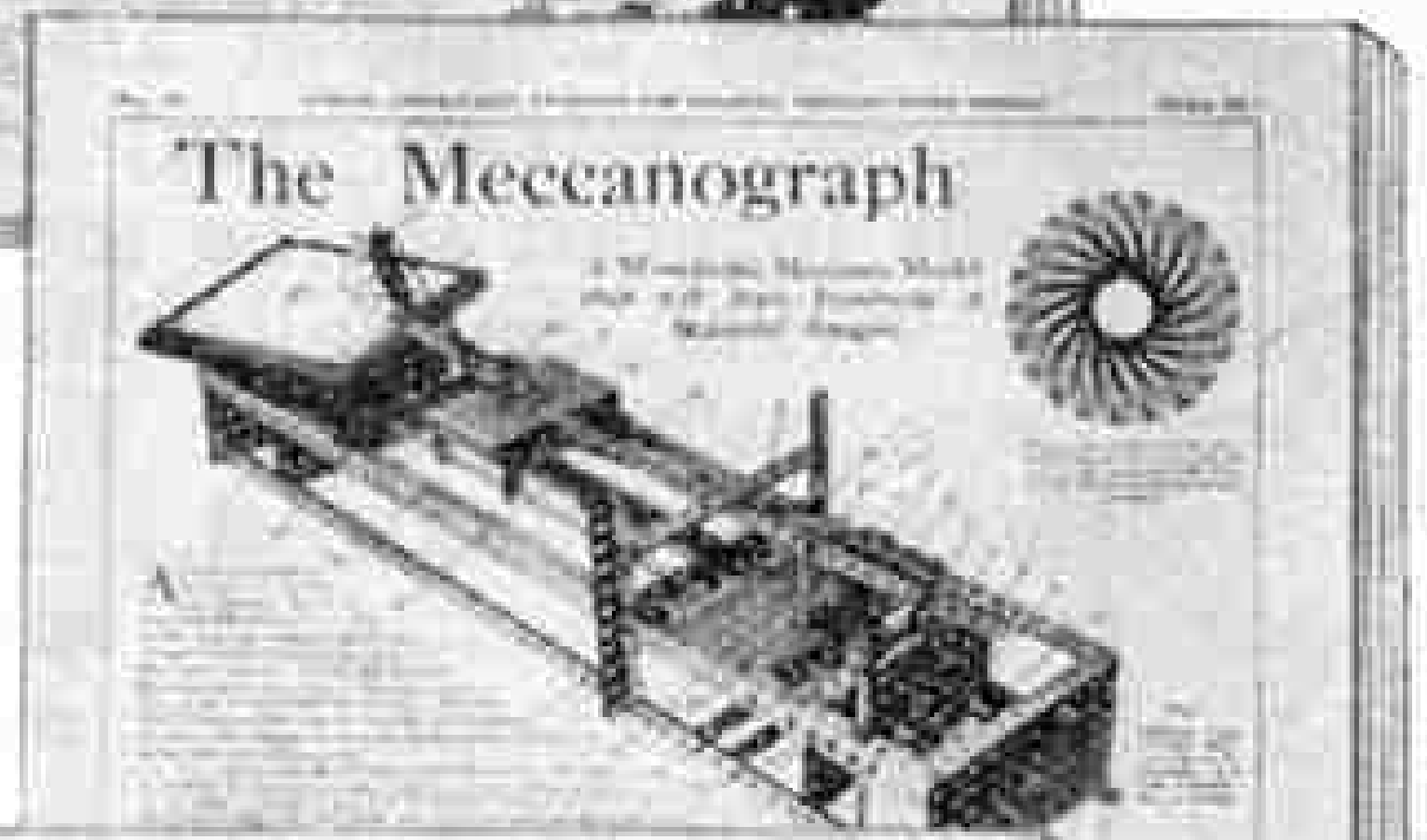
No. 35 LEVEL LUFFING CRANE. The model is provided with level luffing gear, and an important feature is a grab that may be opened and closed automatically.

No. 36 ELECTRIC DERRICK CRANE (Scotch Type). This imposing model is built to a scale of $\frac{3}{4}$ in. to 1 ft. The movements include hoisting and lowering, luffing and slewing.

No. 37 HOWITZER, LIMBER & TRACTOR. The gun fires ammunition (Washers) with considerable force and accuracy. The tractor is fitted with "creeper" track.


Meccano Traction Engine

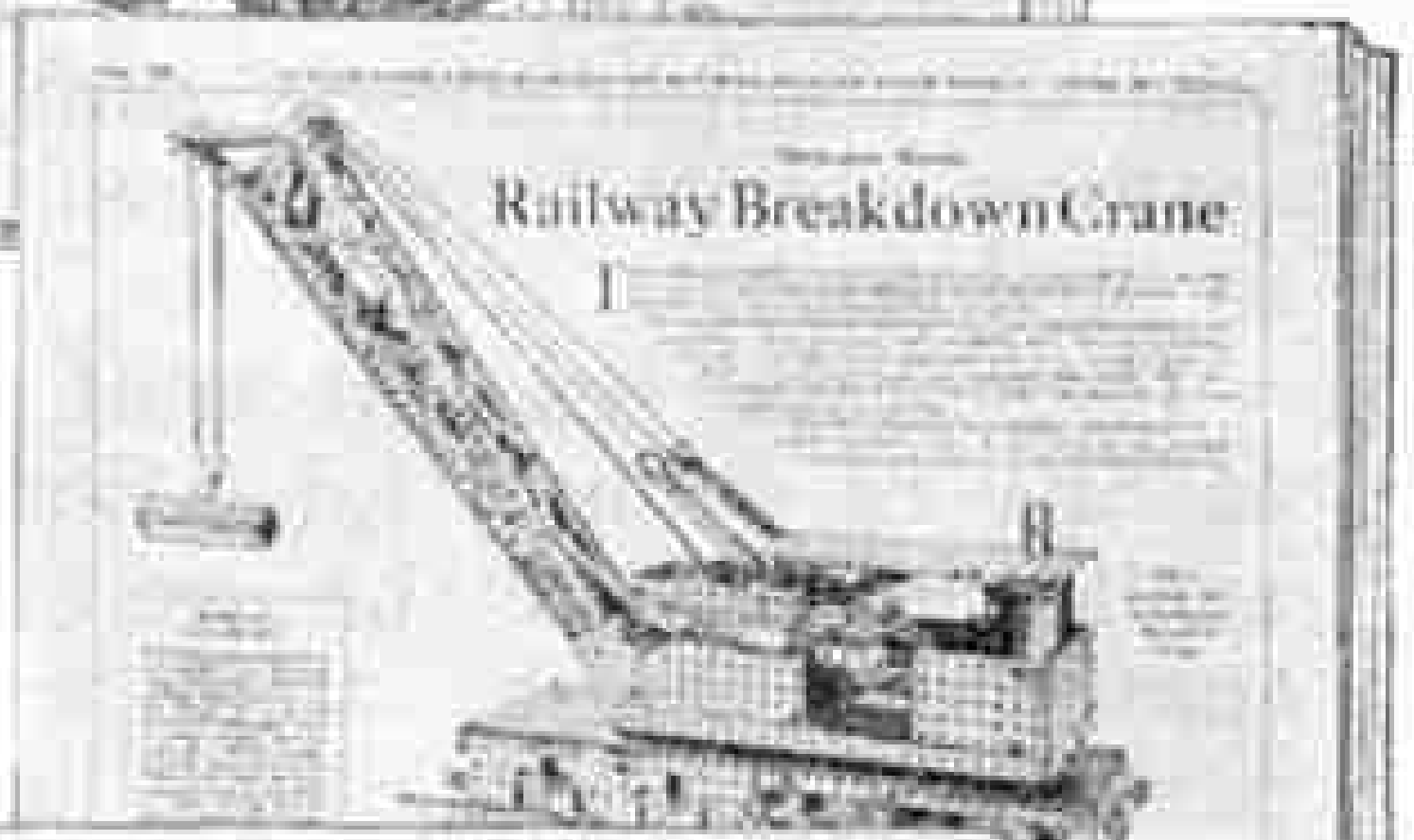
Leaflet No. 22


The Meccanograph

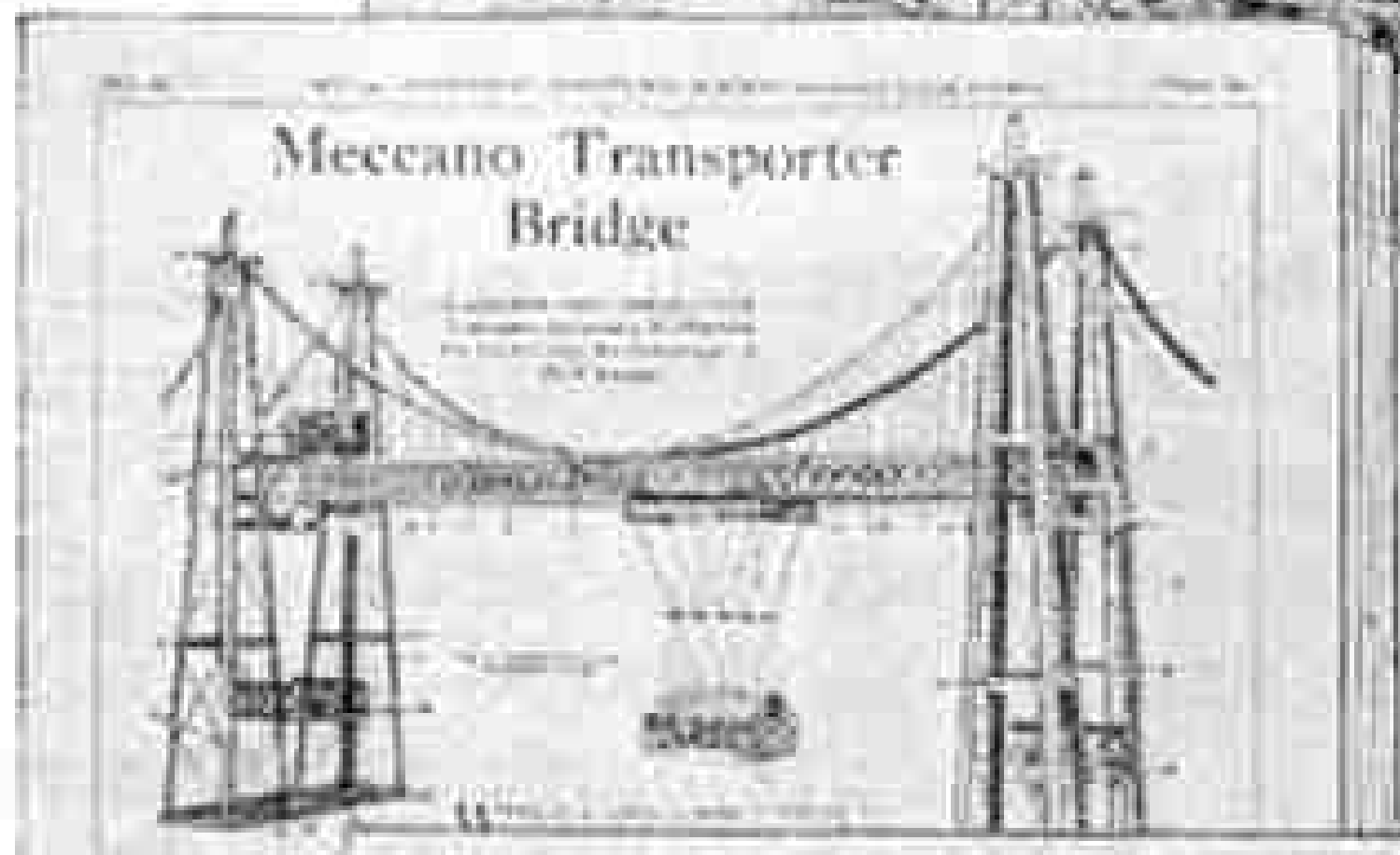
Leaflet No. 13

New Meccano Motor-Cycle and Sidecar

Leaflet No. 3


Railway Breakdown Crane

Leaflet No. 30


Meccano Transporter Bridge

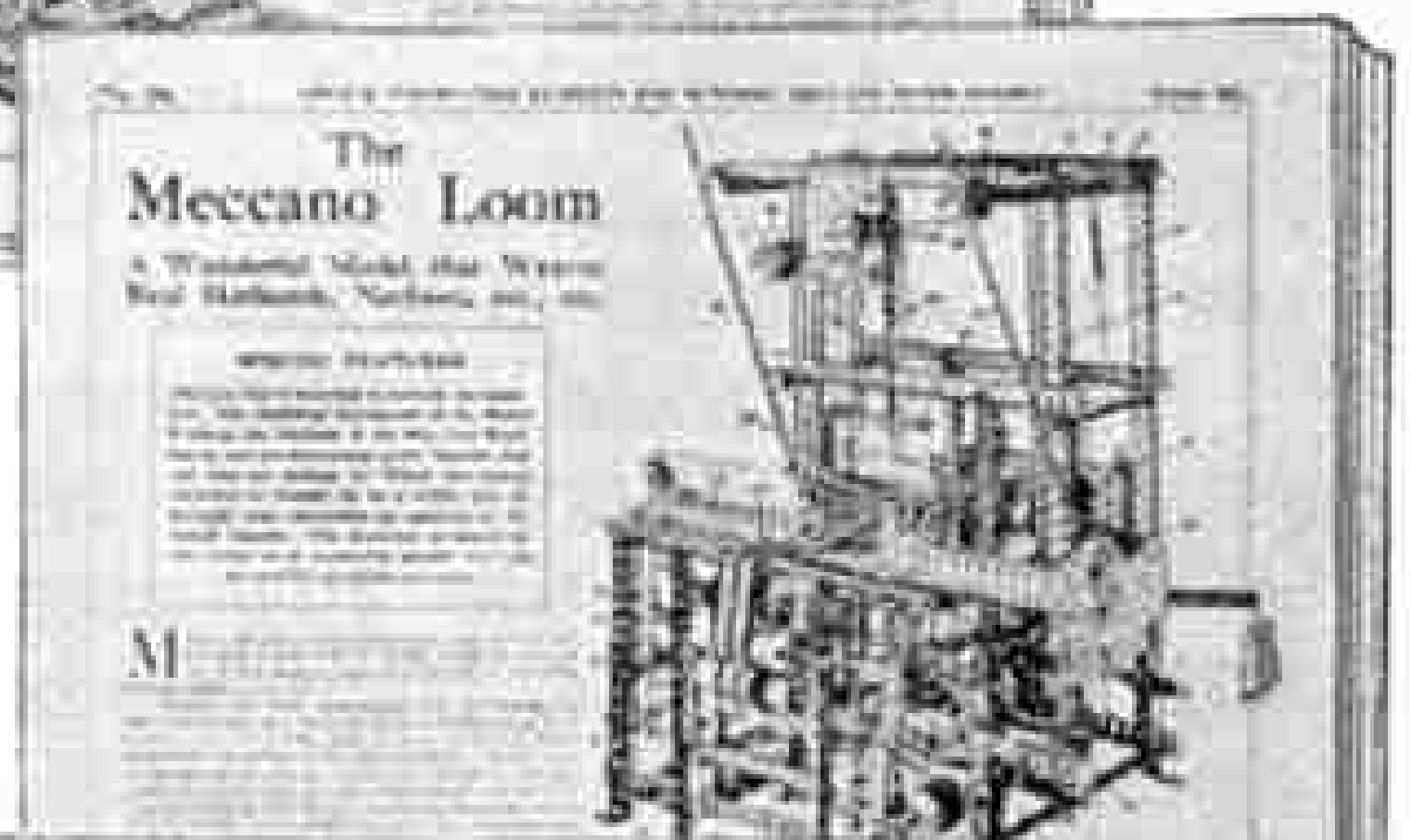
Leaflet No. 21

Steam Excavator

Leaflet No. 19a

Single and Double Flyboats

Leaflet No. 33


The Meccano Loom

Leaflet No. 16a

The Meccano Roundabout

Leaflet No. 8

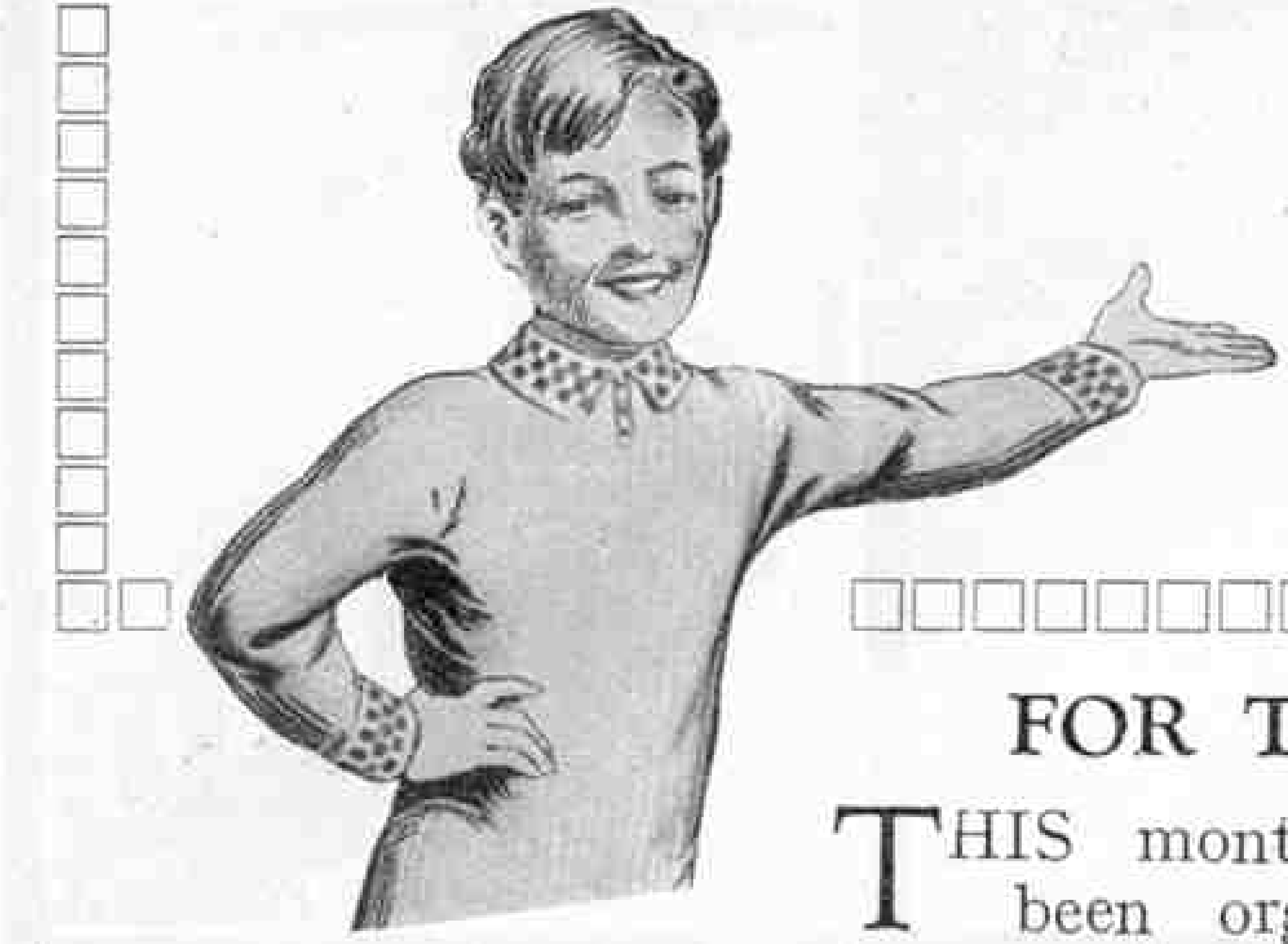
Prices of Meccano Super Model Leaflets :—

Leaflets Nos. 3, 5, 6, 7, 8, 9, 10, 11, 12, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 36, 37—United Kingdom, 2d., Australia 4d., New Zealand and South Africa 3d., Canada 5 cents.

Leaflets Nos. 1, 2, 13, 14, 15, 16, 19a, 27, 30, 31, 32, 33, 34, 35—United Kingdom 3d., Australia 6d., New Zealand and South Africa 4d., Canada 8 cents.

Leaflet No. 4—United Kingdom 6d., Australia 1/-, New Zealand and South Africa, 8d., Canada 15 cents.

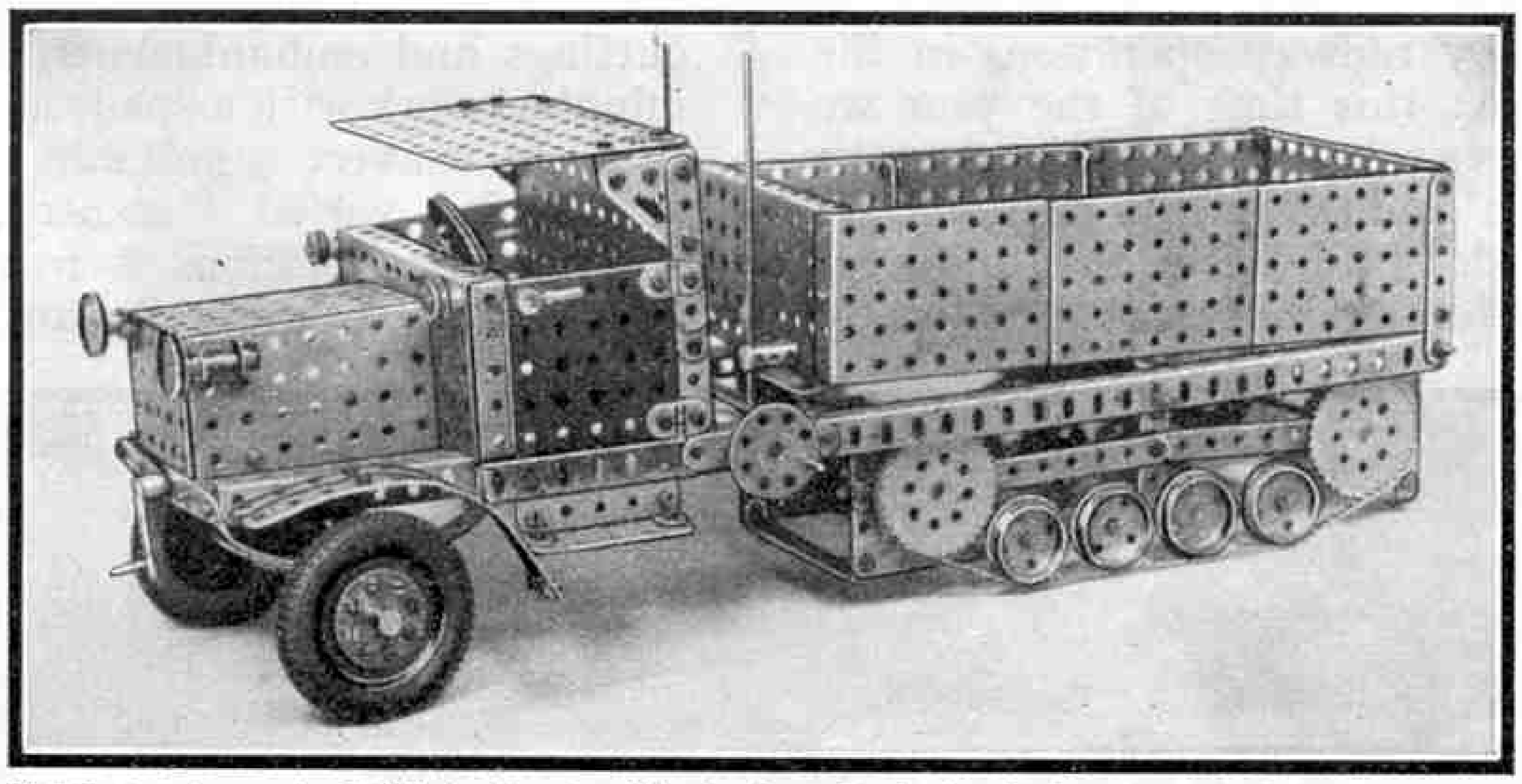
MECCANO LIMITED - OLD SWAN - LIVERPOOL - ENGLAND



Grand Model-Building Contest

FOR THE BEST-CONSTRUCTED MODELS OF ANY TYPE

THIS month's contest has been organised specially so that Meccano model-builders of all ages, and with all sizes of Outfits, may have an equal chance of carrying off the fine prizes listed at the foot of this page. All that a competitor has to do is to think of a new model, no matter how simple, and then set to work and build it from standard Meccano parts. Any size or type of model may be entered, so competitors are at liberty to give full rein to their ingenuity and imagination.



This fine motor wagon is fitted with caterpillar tracks and a tipping body. It was built by J. Sturrock, Barrow-in-Furness, and won a prize in the "Autumn" Model-building Contest, 1929.

Any number of parts may be used in building models, but competitors are reminded that it is not necessarily the largest and most complicated models that will win the prizes. Very often, indeed, the reverse is the case, and a simple model that is well-proportioned and displays sound constructional features, secures a prize in preference to a large and elaborate model that is badly designed and constructed. That is the reason why so many apparently simple models have appeared among the successful entries in recent contests.

Competitors should try to be as original as possible in their choice of subject. Models that really work, or that may be put to some practical use, naturally attract the attention of the judges more than models that will not work, or which fail to reproduce accurately the movements of their prototype.

In judging the models the most telling points will be originality and correct Meccano construction, and special attention will be paid to those models that are likely to prove most interesting to Meccano enthusiasts throughout the world.

In order to give all competitors an equal chance, the entries will be divided into three separate sections, and the age of each competitor will be considered when judging.

The sections are as follows. Section A, for competitors living in the British Isles and over 14 years of age. Section B, for competitors living in the British Isles and under 14 years. Section C, for competitors of all ages living Overseas.

Competitors should send in clear photographs, or if this is not possible, good drawings of their models, together with brief explanations of any mechanical or constructional features that may be present. Actual models must not be sent. Photographs or drawings need not be the competitor's own handiwork but it is absolutely necessary that the model itself is his own unaided work.

Photographs or drawings of unsuccessful models will be returned to the senders, provided that a stamped addressed envelope of the necessary size is enclosed with the entry. It should be noted, however, that photographs or drawings of prize-winning models become the property of Meccano Ltd.

More than one model may be submitted for consideration, but all entries must be enclosed in the same envelope. No competitor can win more than one prize, and if two or more models are entered they will be considered jointly.

The following instructions must be followed closely. The competitor's age, name and address must be written on the back of each photograph or drawing sent in, together with the name of the Contest ("August" Model-building Competition) and the letter A, B, or C indicating the Section in which the model is entered.

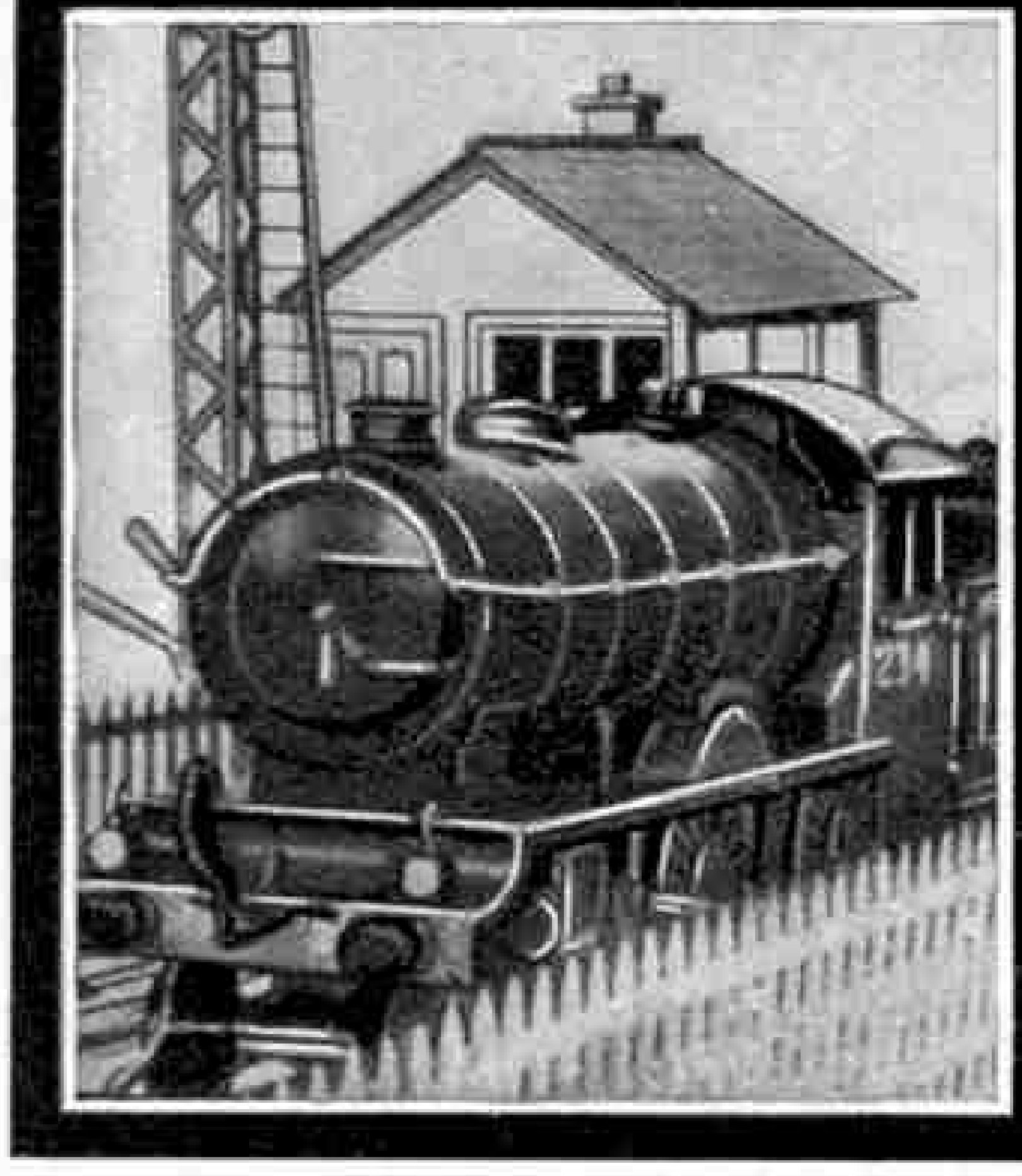
Envelopes should be addressed "August" Model-building Competition, Meccano Ltd., Binns Road, Old Swan, Liverpool.

Readers living in the British Isles must forward their entries so that they reach Liverpool not later than 30th September, 1931. In order to give Overseas readers plenty of time in which to build their models we have extended the closing date for Section C to 30th November, 1931. All prize-winners will be notified by post as soon after the closing dates as possible, and the full lists of awards, together with illustrations and descriptions of prize-winning models, will be published in due course in the "*M.M.*" Competitors entitled to prizes consisting of Meccano goods will have the opportunity of choosing any items they like from current price lists. Models that already appear in any of the Meccano publications are not eligible for entry in this contest.

Prizes Offered in this Contest

The Prizes to be awarded in Sections A and C are as follows :
First Prize : Cheque for £3-3s. and a handsome Certificate.
Second Prize : Cheque for £2-2s. and a handsome Certificate.
Third Prize : Cheque for £1-1s. and a handsome Certificate.
Six Prizes of Meccano real leather Pocket Wallets, value 10/6.
Twelve Prizes of Meccano goods value 5/–.
Twelve Prizes of "Meccano Engineer's Pocket Books."

The Prizes to be awarded in Section B are as follows :
First Prize : Meccano goods value £2-2s. and a handsome Certificate.
Second Prize : Meccano goods value £1-1s. and a handsome Certificate.
Third Prize : Meccano goods value 10/6 and a handsome Certificate.
Six Prizes of Meccano goods value 5/–.
Twelve Prizes of Complete Instruction Manuals (2 vols.).
Twelve Prizes of "Meccano Engineer's Pocket Books."

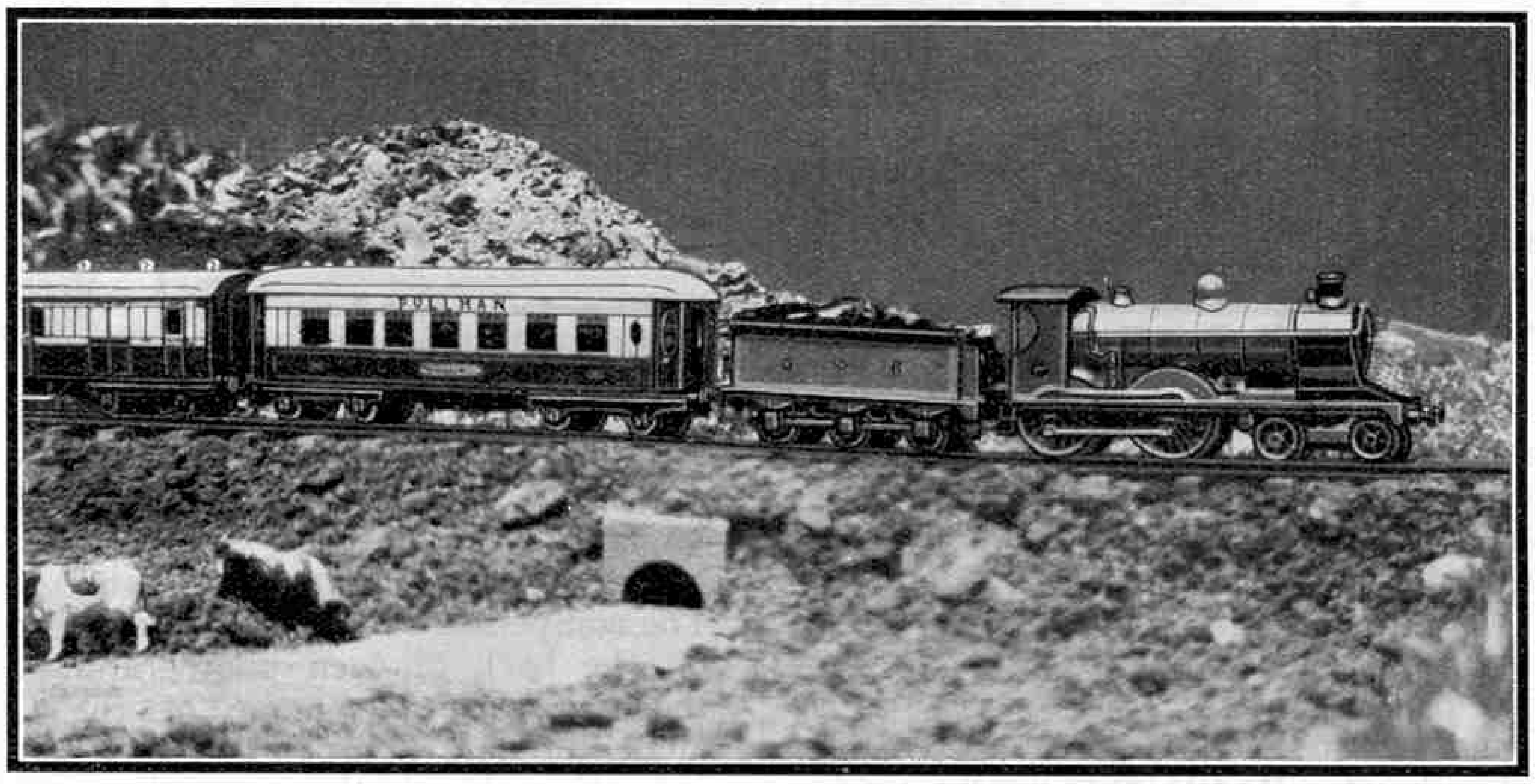


JUNIOR SECTION

XXXII.—MINIATURE RAILWAYS OUT OF DOORS

On a warm dry summer day it is very tempting to transfer a Hornby railway from indoors to the garden and enjoy railway operations in the fresh air and sunshine. At this time of the year we receive many enquiries as to whether it is wise to take Hornby track out of doors; and this month therefore we propose to give a few words of advice on this question.

First of all it must be said definitely that the Hornby System is designed for indoor use, and it is quite unsuitable for permanent outdoor layouts of any description. Exposure to wet or damp weather for even a very short period would cause the track to rust, and the points in particular would quickly become utterly ruined. In a climate such as ours it is extremely unwise to leave the track out of doors for even a single night, however fine the weather may be. What can be done safely is to take the railway out into the garden for a few hours on a dry sunny day. Even in this case it is advisable, in order to guard against the slightest possibility of rust, to wipe over the track piece by piece before putting it away after use. If a shower should occur while the railway is out in the garden, the subsequent drying of the track, especially the points and crossings, should be carried out with the utmost care; and the locomotives and rolling stock should be dried also. Apart from the danger of rust, the only other trouble that is likely to be experienced arises from sand or grit finding its way into the mechanism of the locomotives. With a little care this can be avoided, but if there is any reason to suspect grit in the mechanism—as the result of a derailment, for instance—this should be washed clean with a brush moistened with paraffin or petrol, followed by lubrication with Meccano Oil.



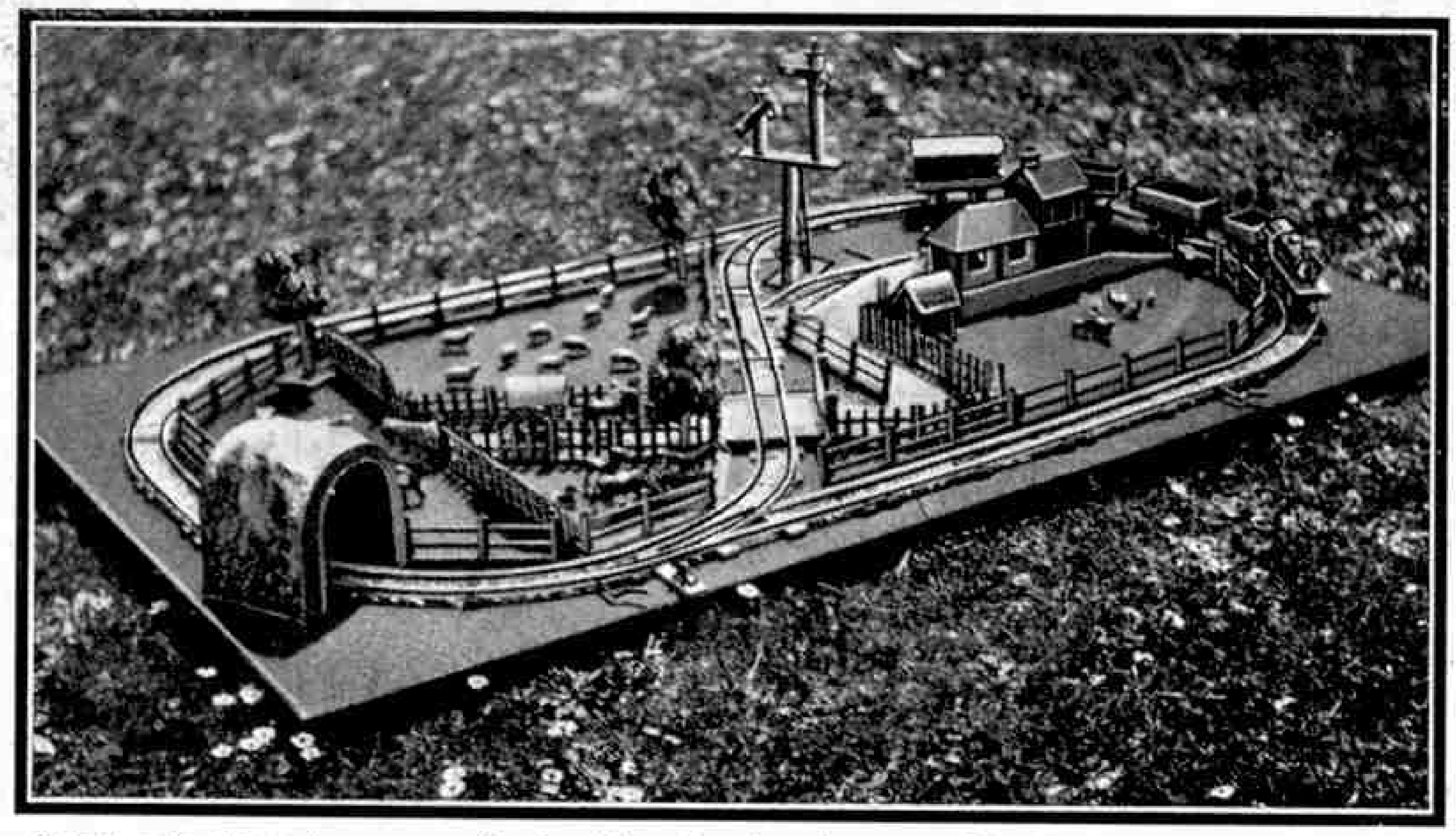
Natural effects are easily obtained on miniature layouts out of doors. An express train is here shown passing along an embankment; beneath this is a culvert through which flows a stream.

The great fun about having one's railway out in the garden lies in the possibilities for securing realistic surroundings. In almost any garden, however small it may be, something can be done in the way of making cuttings and embankments, and even tunnels. A few minutes' work with a spade or trowel is sufficient in most cases to convert a suitable flat stretch of dry ground into quite varied "scenery." The important point about such operations is to make as flat a surface as possible where the rails are to be laid. An uneven surface certainly adds to the excitement of running the trains, but derailments are bound to occur, and these soon become a nuisance, besides being bad for the locomotives and rolling stock.

Gardens vary so much that it is impossible to give any useful hints as to the best type of "scenery" to be prepared, but usually the nature of the ground will immediately suggest all kinds of schemes that may be tried. The line may be carried over narrow valleys by means of improvised viaducts made of pieces of plank; or if a Meccano outfit is at hand, it may be used to build simple girder bridges, which look remarkably attractive in outdoor surroundings. If flat stones are available, such as those that are often to be found in rockeries, these may be used to construct most realistic-looking viaducts, and also they may be built into short tunnels, which afford splendid fun. Sometimes an old drain pipe is at hand, and this, laid on its side, provides an even better tunnel, especially if it is sunk into a trough and covered with earth. The trains will approach this tunnel from cuttings at each end in real railway fashion.

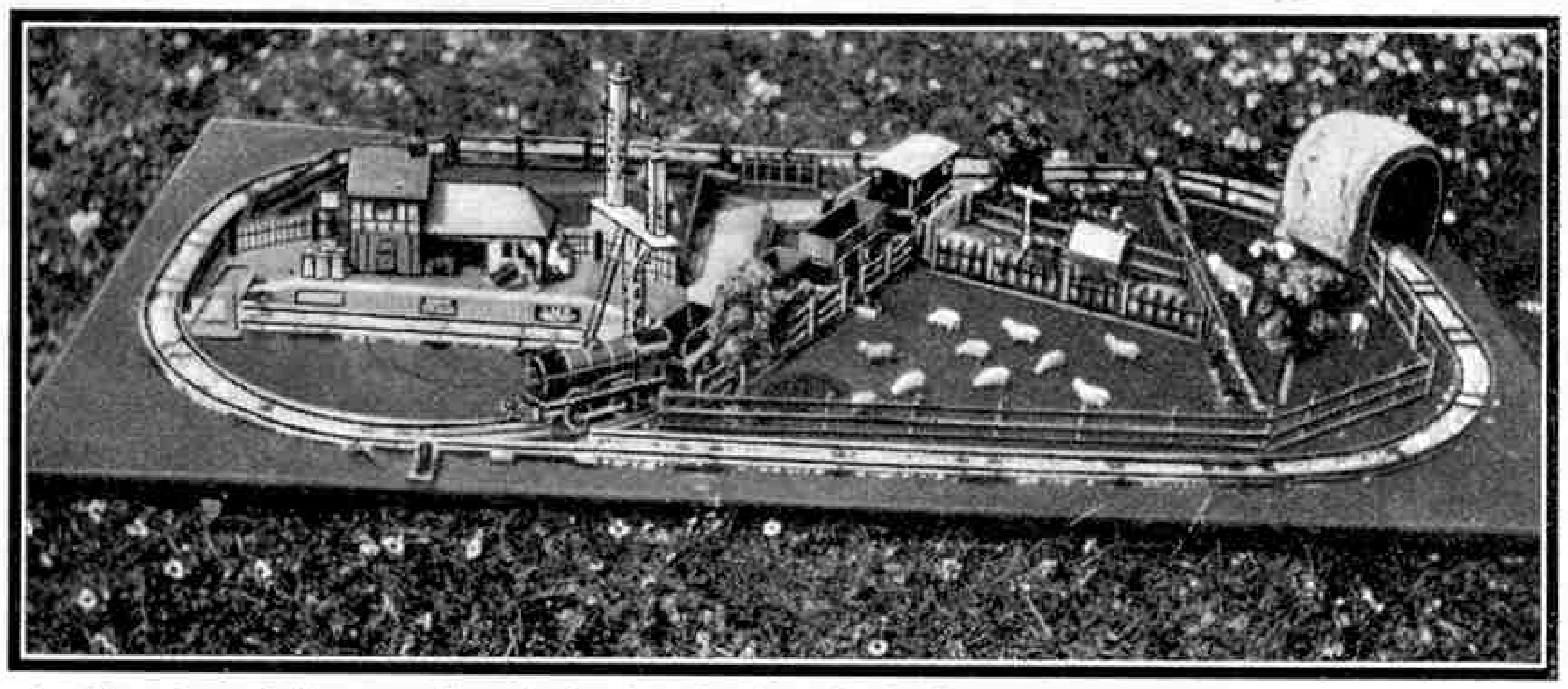
It is good fun to carry out the "scenery-making" operations on the lines of actual railway practice. As the work proceeds and a flat bed is prepared, the track should be laid down piece by piece, so that the trains are close behind the excavating operations all the time. Then, if desired, the "spoil" may be conveyed in open wagons from the point where cuttings and valleys are being made to some other place where it is desired to raise an embankment. A really exciting morning or afternoon may be spent in operations of this kind, especially if two or three boys work together. It is important that the earth to be carried by train in this manner should be quite dry. If it is wet it will stick to the bottoms and sides of the wagons, and be very troublesome to remove.

When the railway is finally laid down, there are almost unlimited possibilities in the way of load carrying. For instance, it may be imagined that the line serves a quarry. Gravel or sand is to be found in the majority of gardens, and this material may be quarried, loaded into mineral trains, conveyed to some other point and there unloaded. Perhaps the material thus carried may be used in the construction of a short branch line, or for making a road in the neighbourhood of the railway. Mention of roads immediately suggests the use of the Level Crossing, which may be placed at some suitable point to lead a miniature highway over the line. Another kind of traffic that may be conveyed is lumber. Twigs of suitable size are ready to hand in the garden, and these look very well when carried on appropriate wagons, giving a splendid representation of the lumber that is regularly handled in many districts.



An attractive layout, permanently fixed to a baseboard, operated by H. Collinson of Sunderland. The various lineside accessories combine to produce a very realistic appearance.

If the garden is so arranged that " scenery making " of any kind is impossible, many hours of enjoyment in the sunshine may be had by laying the track along a flat gravel or concrete paths. In such cases it is usually possible to secure some variety in the way of tunnels, or obstacles of some kind round which the track runs so that at certain points the trains disappear from sight.



Another view of the same layout showing the tunnel, the level crossing, the station and fields. A goods train hauled by an M.1 locomotive is passing the level crossing.

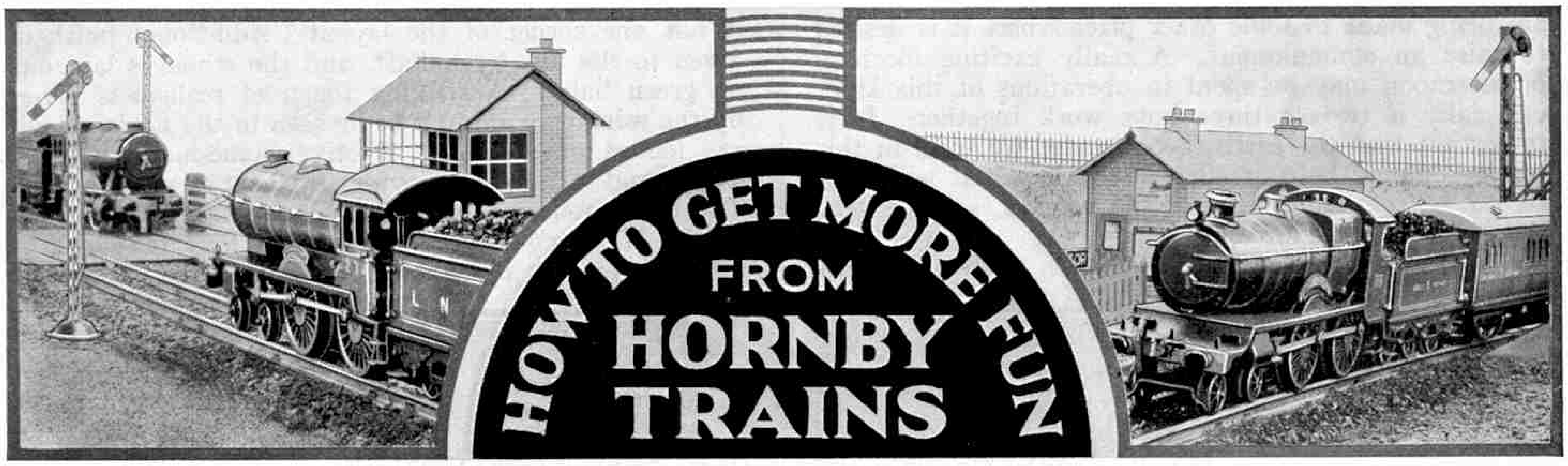
The railway shown in the two photographs on this page is not strictly an outdoor railway, but is arranged on a baseboard, so that it can be taken out of doors as a whole ready for use. This railway is a particularly interesting example of the possibilities of a small layout permanently fixed to a baseboard, and provided with a variety of accessories.

The main track is oval, but by means of points a diagonal track is led across the centre of the layout, passing over a road by means of a Hornby Level Crossing. This road leads to the small station, which is served by a short branch track that terminates there. Traffic at this point is controlled by a Junction Signal, giving access either to the main line or to the station branch. A tunnel is incorporated, and this, following the advice frequently given in these pages, is situated so that it fills one corner of the layout. Additional finish is given to the line by ballast, and the whole is laid out on green baize. A striking touch of realism is given by the miniature animals to be seen in the fields, which are fenced off by very effective home-made fencing. Trees and a hedge provide further scenic interest. The traffic requirements of the layout are met by one of the M1 Locomotives, the normal load of which is two open wagons and a goods brake. As this locomotive has reversing mechanism it is extremely useful for all duties on the railway.

There is something particularly fascinating about a small layout of this kind, full of interesting detail and scenic effects. There is no reason why a large system should not be arranged on this plan, making use of a baseboard in sections.

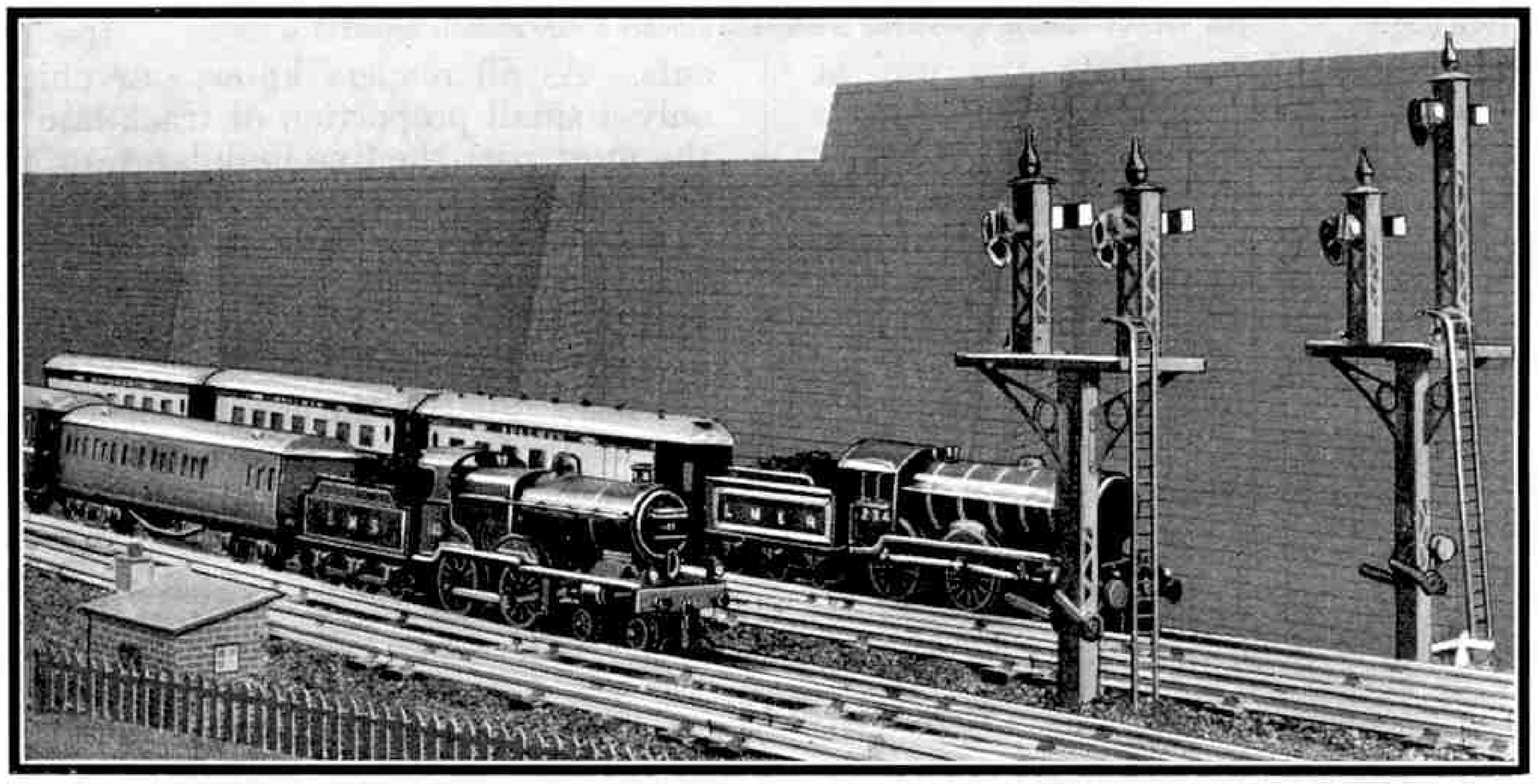
A feature of real railways that is readily copied out of doors is the provision of gradients. As all readers know, our chief main lines have only a small proportion of track laid on the level. For the most part the line undulates, or climbs up and runs down alternately. As a rule the slopes are not great, so that the engines are capable of taking them " on the run " with a load. Sometimes, however, it happens that, owing to an exceptionally steep length of line, an assistant engine is necessary over a portion of the journey. Such is the case, for instance, on the Beattock incline in Scotland on the L.M.S.R., and the Lickey incline near Bromsgrove.

Gradients on model railways add greatly to the interest of the layout, but they should not be made steep or the trains will show a decided reluctance to climbing them, even with two engines, and in descending they will be likely to attain dangerous speeds and perhaps meet with some mishap. It will be found very interesting to watch the behaviour of miniature locomotives on the slope, and the working of the line will have an increased fascination. Arrangements should be made for trains to stop at the bottom of the gradient while the assistant engine is attached at the rear. If the bank is straight the engine need not be coupled, as the buffers may transmit the push without fear of their becoming interlocked with those of the rear coach or van. If the incline curves at all coupling up will be necessary. It is a fine sight to see a miniature express steadily mounting an incline in this manner with a bank engine in the rear. Those who try these operations will find them distinctly thrilling, and will be well repaid for trouble taken in arranging the incline.



XXXIV.—HORNBY RAILWAY SUMMER SERVICES

DURING this period of the year the majority of Hornby Railway owners pay a visit to the seaside or to the country, or at any rate to some other town. In order to reach their destinations they will in many cases travel over unfamiliar sections of line, and on the journey they will see a variety of interesting train operations and features of working. The natural result of this will be a desire to reproduce such working in miniature on their Hornby railways when they return home.


Joint working on a Hornby layout. A Pullman express hauled by an L.N.E.R. locomotive is working on the same line as an L.M.S.R. train. Both are held at the signals owing to the press of summer traffic.

Excursion trains are now run on an extensive scale by all our railways, and the number operated during the summer months may be reckoned in thousands. Owing to the facts that special arrangements have to be made for their working and that they frequently run over unusual routes, these trains are of the greatest interest to the railway enthusiast. They are hauled by a variety of locomotive types, and it is by no means unusual to see a goods engine at their head. Very frequently they are hauled by "mixed-traffic" locomotives, for although they are usually made up of a large number of coaches, they are required to travel at a fairly good average speed.

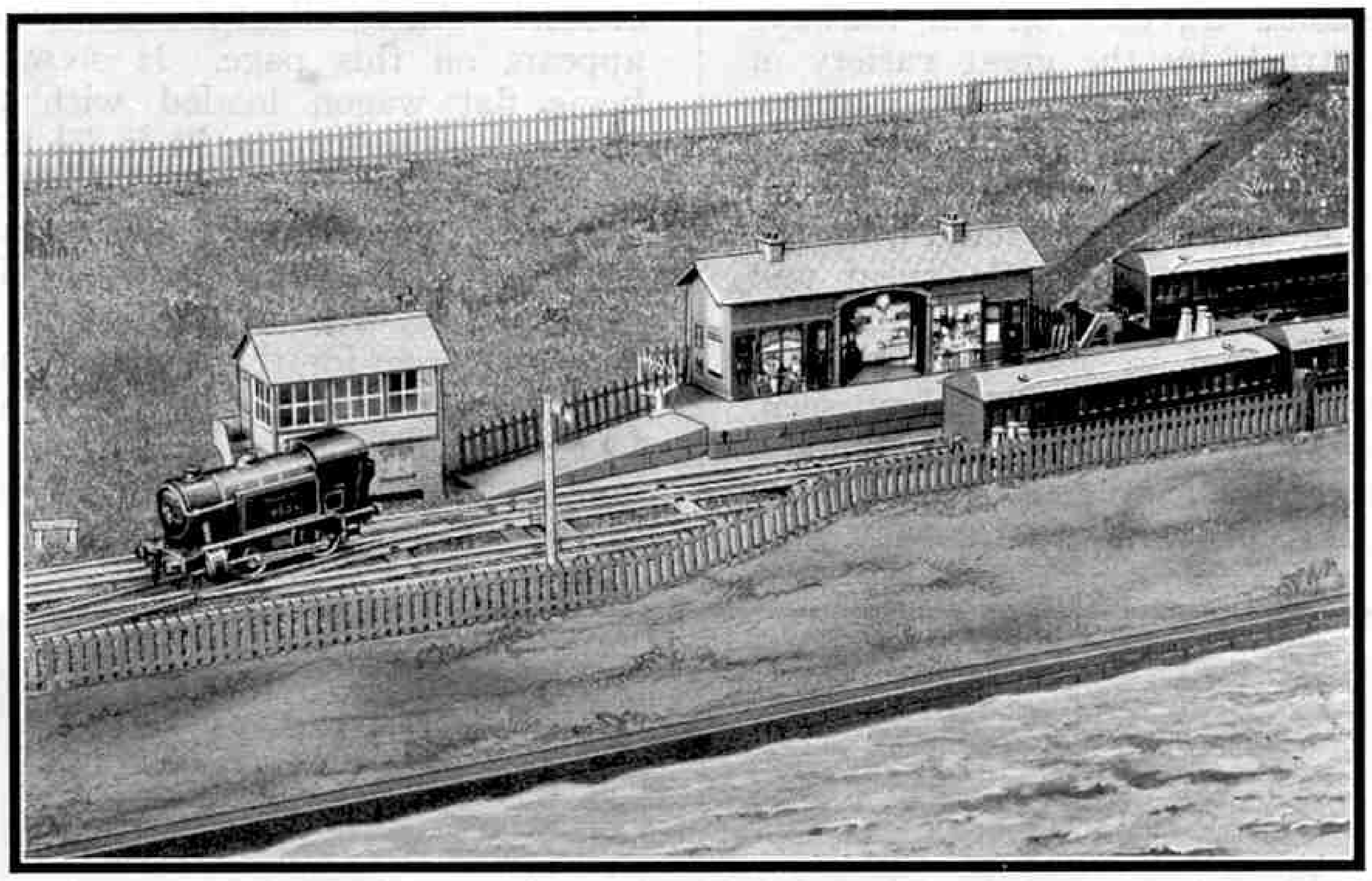
A Hornby railway may be supposed to include a holiday resort in its layout, and it is interesting to arrange excursion trains from inland manufacturing towns to this place. Such trains may be made up of No. 2 Saloon Coaches, with a Composite Metropolitan Coach at each end. This represents a useful formation for long-distance excursion trains where dining facilities are provided, and a miniature train made up in this manner looks most realistic. The type of locomotive best suited for the hauling of these trains is the No. 1 Special. This is essentially a "mixed-traffic" locomotive and, as was pointed out in these pages of the May *"M.M."*, it is equally well suited to goods or passenger work. If there is no No. 1 Special Locomotive available, or if the excursion is on a fast schedule, a No. 2 Special or No. 3 Locomotive may be detailed to haul it. This will be quite in order, for it frequently happens that the largest and most powerful passenger locomotives of the four groups are used on long-distance excursion trains.

As far as possible the train should be kept strictly to time, or dislocation of other services will be the result. Special arrangements should be made, therefore, when drawing up the working timetable to allow of the train being included without interfering with the regular services.

In addition to excursion trains there are specials run for large parties from various societies or works, and trains run to the scene of some special event, such as a race meeting. For such trains arrangements similar to those made for excursion trains are necessary. A notable feature of recent railway practice has been the extensive employment of Pullman vehicles for race trains, so that in miniature working the use of No. 2 Special Pullman Coaches will be quite in order. It is frequently necessary for trains of this kind to run over the lines of more than one company, and particular attention has then to be paid to the working arrangements. Similar conditions may be obtained in miniature, where a layout is operated jointly by two or more owners. In such a case it almost invariably happens that the stock of a different company is represented, and therefore it is quite easy to arrange for some very interesting working of this kind, where the engines and rolling stock of two different companies operate side by side on the same layout.

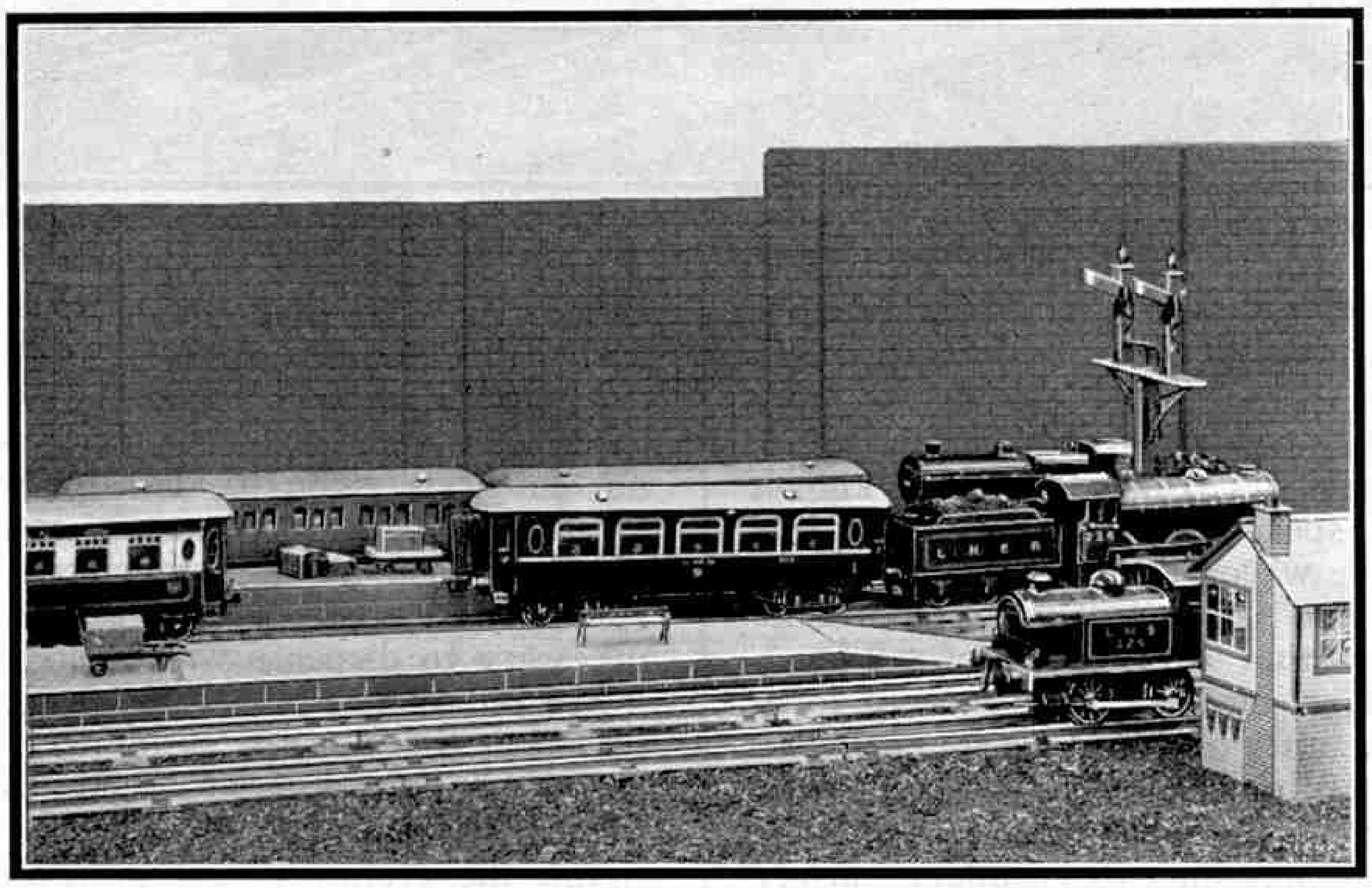
This brings us to another feature of working that may provide considerable entertainment. In addition to the working of complete trains through on to other companies' lines, there are run during the summer large numbers of what are known as "through coaches."

These coaches are a great convenience to passengers, as they obviate the necessity of changing at junctions. In the ordinary way a traveller might have to change several times in order to reach his destination, but by travelling in a through coach he will not need to change at all, which is a great convenience when a considerable amount of luggage is being taken. These coaches operate between various towns, often far apart, between which it would not be worth while to run a regular train service. The possibilities of this kind of operation are illustrated in one of the accompanying photographs, which shows an L.M.S.R. Saloon Coach being transferred to an L.N.E.R. Pullman Express to complete the journey to its destination.



A station on the coast. The train is terminated here, and the locomotive is crossing over so as to run round the coaches and make the return journey.

A through coach during its journey may be transferred from one train to another two or three times. For instance, to start with it may be hauled by a slow passenger train; at the next junction it may be picked up by a main line express; and finally it may be transferred to an ordinary passenger train. These through coaches in most cases operate over the lines of more than one company, and they are run across Great Britain from north to south and from east to west. For instance, such services are in operation from Aberdeen to Penzance and from Liverpool to Lowestoft. It is a good idea to feature one or two through coaches in the timetable of a Hornby railway, and to arrange for them to be dealt with by a number of trains until they finally reach their destination, which may perhaps be on a local or branch line, as suggested in the "Junior Section" pages recently.



A through coach from the L.M.S.R. being attached to an L.N.E.R. train. Operations of this kind add much to the interest of a layout and are particularly appropriate at this time of the year.

In addition to the usual holiday traffic there is another feature worthy of mention; this is the special arrangements necessary for people travelling North for the grouse shooting that commences on 12th August. At this time there is a great demand for sleeping cars on the night trains, and it is by no means unusual for a Highland express to be despatched in several portions. Here again there are ample opportunities on a Hornby layout for reproducing such trains. The No. 2 Saloon Coaches are ideal for the work, and it is possible to make them look like luxurious "sleepers" in a very short space of time. Strips of tracing paper should be cut, each 8¾ in. in length by ⅝ in. in width; and these should be slipped in the end window and gently worked along inside the coach between its side and the celluloid "glass." If this is done carefully, without creasing the paper, until all the lower window spaces are covered, the result will be quite a pleasing representation of a sleeping car with blinds drawn. No adhesive is necessary, as the paper is held between the coach side and the celluloid, and thus it is easy to convert the coaches back again to their normal use when required. The operation of such trains will probably be a novelty on most layouts, and owners of miniature L.M.S.R. and L.N.E.R. systems in particular will be glad of this opportunity of introducing still further examples of realism into their working arrangements.

Tracing paper used to imitate ground glass may be applied to the representation of kitchen or pantry compartments in dining cars. Thus if two No. 2 Saloons are run together as a pair of dining cars, one end window of each may be covered to represent the adjoining kitchens, thus increasing considerably the realistic appearance of the train. If a single car only is being used, a central kitchen will be appropriate, so that the middle window only will be covered. Improvements of this kind may seem trifling in themselves, but their effect is surprisingly good. A great many sleeping and restaurant car workings are now in force on British railways, so that by adopting these hints Hornby railway owners will be able to keep their railways abreast of the times.

It frequently happens at holiday periods that a train is unduly loaded. The total length of the coaches is likely to exceed the length of the platforms at various stations along the line and thus cause delay through the necessity of drawing up twice. The train may be divided into two or more portions as required, each being run as a separate train. This scheme may well be followed in miniature, for

(*Continued on page 662*)

Special Wagons in the Hornby Series

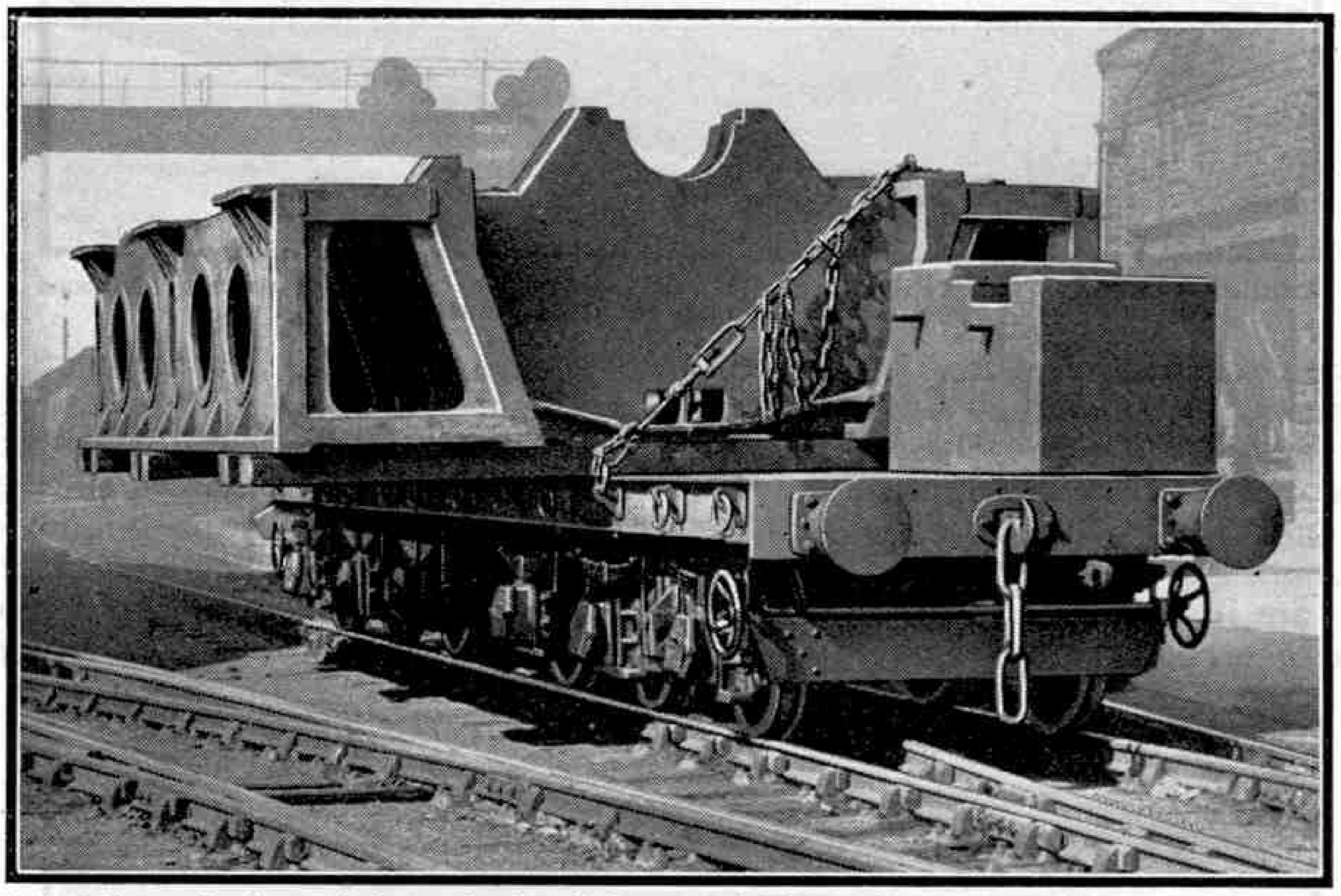
By "Tommy Dodd"

EVEN the most occasional traveller on our railways cannot fail to be struck by the great variety of goods wagons that he sees in the course of a journey. Among these are the various types of open wagons used for coal, mineral and general goods traffic; and covered vans for goods that must be protected from the weather, and for the conveyance of cattle, meat and fish. There is indeed enormous variety among these commoner types of vehicle, but in addition there are other special types that are much less seldom seen, because they are used for the carriage of freight of a more unusual character. Such wagons have many unique and interesting features. In general they may be said to be designed to convey specially heavy or bulky loads, with which the ordinary types of wagon are unable to cope.

The smallest of the special type vehicles is the four-wheeled well wagon. This is built in several varieties and is used for carrying such loads as furniture vans, steam tractors, agricultural machinery, tram-cars, and crates or cases that are too high to be loaded on to the ordinary type of flat wagons. Some of these well wagons have a unique appearance, owing to their special construction. They are built up of girders, so that one is able to see through all parts of the wagon; they are in fact more or less frames on wheels.

The bogie trolley wagon or "rulley" as it is known in Scotland is another special vehicle of considerable interest. The ends of the wagon are of the usual height and are supported by the bogie trucks. The middle of the wagon is sunk to within a few inches of rail level, forming a well that allows of the conveyance of lofty articles of freight. Sometimes long girders are conveyed on these wagons, arranged in such a manner as to span the well. The loads conveyed by wagons of this type range up to 50 tons and take an extraordinary variety of shapes.

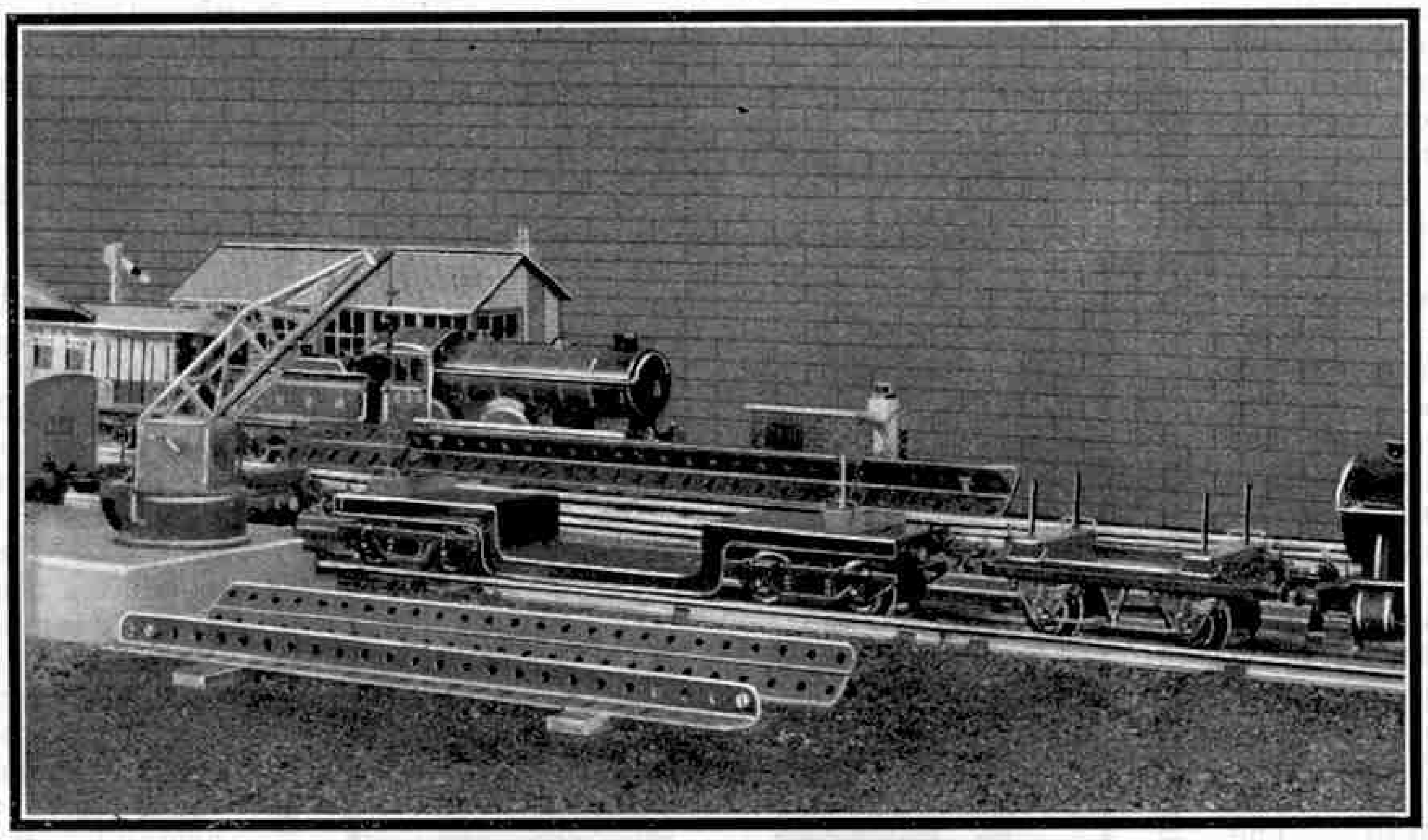
Then there are the bogie flat wagons that are employed for carrying heavy loads that are not of abnormal height, and which do not require the use of a well. When exceptionally heavy loads have to be carried a twelve-wheeled flat wagon is used. This is made up of a steel underframe mounted on two six-wheeled bogie trucks, and the floor is constructed of extra stout timbers or of steel. An excellent illustration of one of these wagons appears on this page. It shows an L.N.E.R. 60-ton bogie flat wagon loaded with a bed-plate weighing 30 tons and measuring 21 ft. 7½ in. in length, 14 ft. 7 in. in width and 5 ft. 6 in. in depth. Owing to the great width of this casting it had to be placed out of centre on battens projecting to the "six foot way" side of the track, the overhang being no less than 6 ft. In order to compensate for this overhanging weight the opposite side of the wagon was loaded with 20 tons of "ballast." Loads of this nature are known as "out of gauge," because they do not conform with single-track gauge limits.



A typical example of an out-of-gauge load carried on a special 12-wheeled wagon. Weights had to be added on the opposite side of the truck, so as to balance the overhang of the casting.

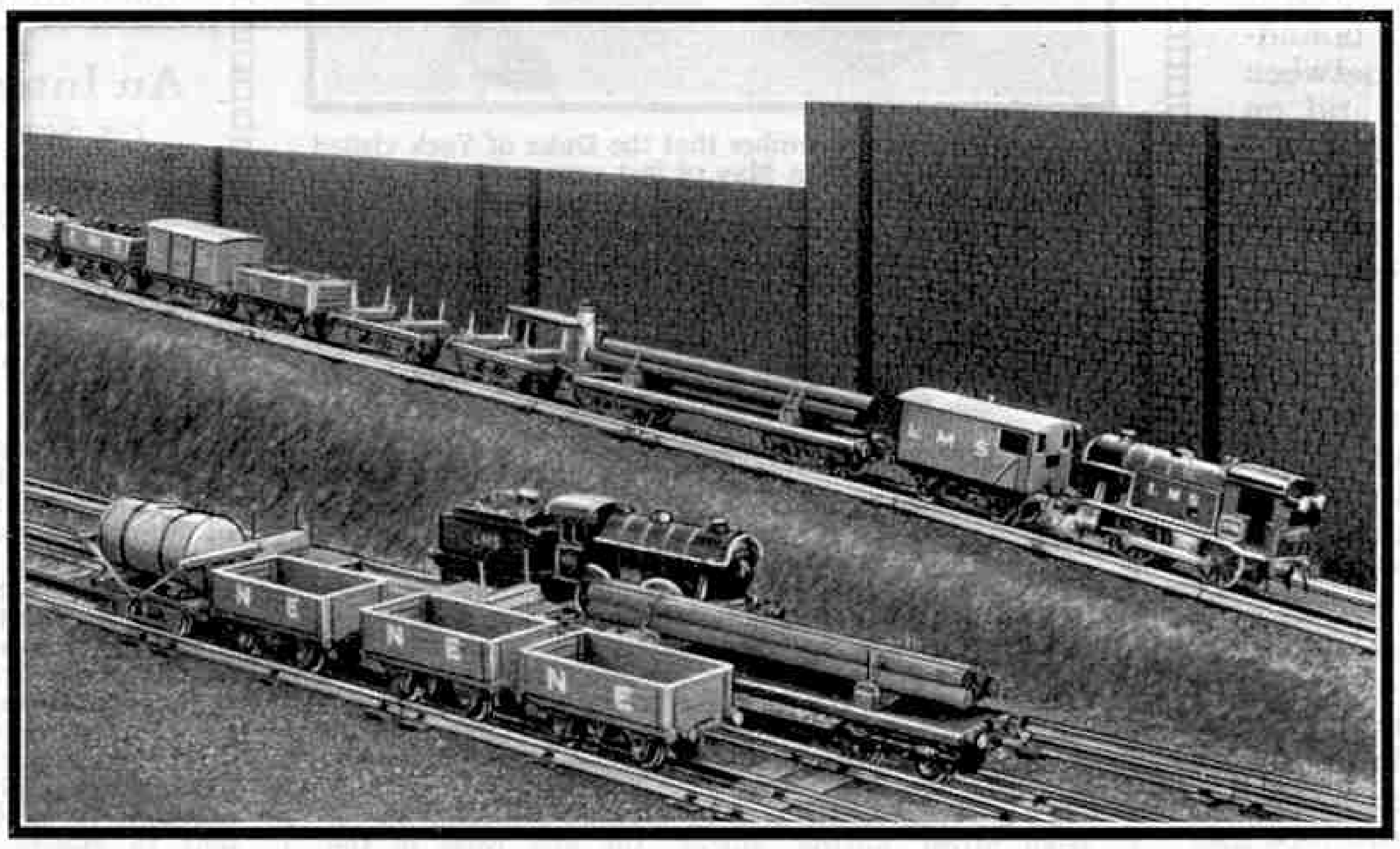
Wagons for lumber, and timber traffic generally, do not exist in great variety, and are usually simple in design. They are flat wagons having stout beams or "bolsters" across them to support the load; and at each end of these bolsters vertical stanchions are fitted to keep the load in position. Tree trunks taken from the forest are conveyed to the saw mills either on four-wheeled or eight-wheeled bogie wagons. If the logs are shorter than can be conveniently carried on the eight-wheeled type, the four-wheelers are used; and if longer, several four-wheelers may be run together to bear the load. When two or more four-wheeled wagons are traversing curves, the necessary movement is given to the logs by the pivoting of the bolsters. Bogie wagons are seen with two or more bolsters each having stanchions at the ends. These stanchions are usually made detachable, as it is sometimes necessary to dispense with some of them.

Special wagons of the foregoing types are well represented in the Hornby System by the Trolley, No. 1 and No. 2 Lumber, and No. 1 and No. 2 Timber Wagons. Like the Snow Plough and the Breakdown Van and Crane, the Trolley Wagon is in a class entirely by itself. There is no other model like it, nor can any other take its place; and for this reason every model railway should possess one. Its length over buffers is 12¾ in., of which 4⅜ in. is the well, sunk to a depth of 1 in. A bolster fitted at each end of the wagon is provided with two stanchions, and a generous length of chain that proves very useful for securing Meccano Girders or other similar loads. The two pairs of stanchions are 9¾ in. apart, so that Meccano 12½ in. Angle Girders can easily be fitted in place. A few hints about loads will be given later. If the wagon is tested gently with the hands it will be found to resist a very considerable amount of strain, and this is due to the construction of the frames being carried out in such a manner as to be of "channel" section, as in actual practice. In the well floor are four narrow slots, the use of which has puzzled many Hornby railway owners. These slots are provided as an additional aid in securing the load, by means of a chain or cord passed through them.



Loading a girder on a Hornby Trolley Wagon. As it projects beyond the ends of the trolley, a four-wheeled Lumber Wagon is added as a "runner wagon" at each end.

The No. 2 Lumber Wagon is the same length over buffers and the same width as the Trolley Wagon. Bolsters with stanchions and chains are also fitted, but they are much nearer together than those of the Trolley Wagon, being made 6⅝ in. apart, in order to suit varying lengths of logs. The four-wheeled bogie trucks are standard with Hornby Train practice, for they are fitted to all the No. 2 wagons and vans, and to most of the eight-wheeled passenger vehicles. A suitable load of logs is provided. The smaller reproduction of this wagon, the No. 1 Lumber Wagon, is now built with the latest standard base, with tie-bars and imitation brake hangers. Neatly embossed springs are included, and there are two slots in each axle guard in which detachable axleboxes may be fitted. The bolsters on these wagons are 3 in. apart, so that the logs supplied with the larger wagon, if cut in half, become of convenient size for this wagon.



Hornby No. 2 Lumber Wagons are seen in this photograph suitably loaded. Bogie wagons of this kind may be run singly, but the four-wheelers are usually found in pairs.

The No. 2 Timber Wagon also is constructed on standard principles, but instead of stanchions mounted on bolsters ten strips of metal are pressed out of the wagon base and stand vertical to guard the load. In between these strips a load of sawn wood fits neatly. The No. 1 Timber Wagon is similarly made, with a standard four-wheeled base; and it also is sent out with a small load of wood.

Another use to which these four-wheelers can be applied is that of "runner wagons." This means simply that on occasions with loads slightly overhanging the buffers of the wagon on which they are carried, these small wagons are coupled up as a precautionary measure to prevent them from damaging adjoining vehicles. Runner wagons are used also in conjunction with engineering loads, such as have already been described, and they are always employed with the breakdown crane to make up for the space taken by the jib. It is not necessary therefore to employ the No. 1 Lumber and Timber wagons solely for carrying loads, for they can be used just as correctly as runner wagons to the Trolley Wagon, No. 2 Lumber and No. 2 Timber wagons, the Breakdown Van and Crane, or to the crane truck itself.

In providing suitable loads for all these Hornby special wagons, excellent use may be made of a variety of Meccano parts and parts of Hornby Trains. For instance, if 12½ in. Meccano Angle Girders are used, two can be bolted together in order to make a "T" section girder. When longer girders are required in order to bring the runner wagons into use, the girders may be joined so that their ends overlap, thus giving an original appearance that helps greatly towards producing a realistic effect.

The No. 2 Lumber Wagon can very well be used for transporting Meccano Girders, Strips and Rods; while the No. 1 Wagons look well carrying such articles as channel segments, windmill sails or propeller blades. In the case of the Trolley Wagon it requires a little more thought to make up a suitable load, as this must consist of something that necessitates using the well or the bolsters provided. The No. 1 Wagons make good loads for this purpose, as the wheels may be accommodated in the four slots in the well floor of the Trolley Wagon. Another interesting load is provided by the No. 1 Special Tender, for its wheels fit accurately into the slots, and its solid construction gives the wagon thus loaded a surprising appearance of realism. It may even represent a tender going for repairs or for shipment overseas.

Loads such as electric stators, transformers or motors can easily be made out of cardboard, as their general outlines are simple, and if closely followed give exactly the desired effect without requiring much detail. Good use can be made of tobacco and cocoa tins in making models of boilers, oil, water and gas tanks. The model railway enthusiast will be well repaid for the time spent in making equipment of this nature for his railway, not only in the satisfaction of having reproduced as far as possible actual practice, but in the pleasure that is derived from the actual construction.

How to Get More Fun—

(*Continued from page 659*)

here an excessive length of train is very undesirable. If for any reason it is not possible to divide a train in this manner, an interesting alternative is to provide a pilot engine to assist in dealing with the heavy load. This will provide more fun in the operation of the train, for not only is the behaviour of the engines very fascinating, but the spectacle of a double-headed express hauled by two Hornby locomotives is remarkably attractive. As regards the question of returning the pilot engine to its depot, there probably will be a good opportunity of another heavy train in the opposite direction requiring to be piloted or divided, so that in most cases the engine will be able to reach its home shed without any " unproductive mileage."

Most readers will know that excursion, special and relief trains carry numbers pasted on a board fixed on the smokebox door. These are known as reporting numbers, and by means of them the train is immediately identified by the various signalmen concerned. In miniature practice also such numbers prove useful, especially on a branch layout, both as a means of reference in working timetables and for assisting the operators in identifying the trains. The number boards can easily be made from white cardboard and either fitted on the top lamp bracket or suspended from the handrail. The appearance of a Hornby excursion or special train labelled in this manner is very realistic.

Camping Grounds in the Rockies—

(*Continued from page 629*)

made in 1909 after two previous attempts had failed; and to accomplish the task required no less than 20 days of continuous struggle.

Another wonderful game preserve is Rocky Mountains Park, which is bounded on the west by the boundary between Alberta and British Columbia, and on the east more or less by the first big ranges of the Rockies. It has an area of 2,751 square miles, and its greatest length is about 100 miles. Banff, the administrative headquarters of the park, has been for many years one of the most popular mountain resorts in Canada. In addition to the beauty of its situation it has the distinction of possessing some remarkable hot springs. The five chief springs have a total flow of about one million gallons a day, and issue from the ground all the year round at a temperature ranging from 78 to 112 degrees F. The waters are radio-active, and have considerable curative properties. About one-and-a-half miles from Banff is an immense fenced-in area in which buffaloes, mountain sheep, goats, moose, antelope and other creatures of the wild roam at will through the vast forest pasturage.

Another feature of Rocky Mountains Park is Lake Louise. This beautiful lake lies in a deep walled recess produced by glacial erosion, 600 ft. above the railway. The colours of the lake are of striking beauty, varying continually from dawn to sunset. Pine-clad peaks come down almost perpendicularly into the lake, and beyond are the great snow-clad mountains. A thousand feet above Lake Louise is Lake Agnes, a wild tarn shut in by sombre cliffs. The Indians used to call this lake the " Goats' Looking Glass."

Electric Motor Essay

Few competitions provide so wide a scope for the boy of vision as the Electric Motor Essay, which is to remain open until the end of next month.

In this competition readers are invited to cast their eyes around their homes to discover jobs that could conveniently be carried out by a small portable electric motor, and then to write to us outlining their ideas. Every reader whose home is wired for electricity is well placed to take part in this competition, full details of which were announced on page 519 of the June issue. Valuable prizes are offered for the best suggestions received before 30th September from readers at home or overseas.

Readers who missed the June magazine should write to the Competition Editor of the "*M.M.*" for full particulars of the prizes and conditions of entry.

For the Duke's Camp

Readers will remember that the Duke of York visited the Meccano factory in May of last year, and was keenly interested in the various processes of manufacture, which were explained to him by Mr. Frank Hornby.

Our photograph shows Leonard Andrews (left) and John Appleby, two boys employed at the Meccano factory, Liverpool, who have been honoured with an invitation to the Duke of York's camp at Southwold during the first week of this month. Andrews is employed in the Tool Room, and Appleby in the Tool Store.

Local Model-Building Contests

Local model-building contests organised by Meccano dealers are steadily increasing in number and popularity. The average standard of entries is distinctly higher than it was a year or two ago, which shows that competitors are taking these contests more seriously and putting their best work into their models. This month we have to announce the results of two interesting contests.

In the competition held by William Pile Ltd., 46-50, High Street, Sutton, Surrey, the first prize in the class for boys from 9 to 12 years of age was won by P. Vine with an excellent model of a Steam Roller; and the second prize went to E. P. Gawne, for a model of the " Bluebird " Racing Car. Each of these models was fitted with a Meccano Clockwork Motor. In the class for boys of from 13 to 15 years, A. C. Green carried off first prize with a well-designed model of a Ship's Coaler; and R. A. Gibb obtained second prize for a Steam Wagon model fitted with an E1 Electric Motor.

The contest held by Messrs. A. J. Norton & Sons, Key Hill, Birmingham, was divided into two sections. In the first section L. F. Wright was successful with a two-seater Sports Coupé with three-speed gear and reverse and four wheel brakes; second prize going to J. R. Harvey with a low loading Six-wheeled Lorry. In the other section the first prize was awarded to B. Henbury for a Windmill; the second to D. Clayton for a Tractor and Trailer; and the third to J. Robinson for a model of a G.W.R. Cargo Boat.

Seasonal Variation in Goods Traffic—

(*Continued from page 623*)

more coal than the markets could absorb. This of course was not entirely a railway problem, but the recommendation was made that storage of coal on a large scale should take place during the season of low demand, incidentally affording relief to the railways by minimising the greatest demand upon them.

Wagon control is carried out on the grand scale in the United States by the Car Service Division of the American Railway Association which, working in a series of regions, allots cars to each locality according to its needs, with a special view to dealing with seasonal rushes. A careful estimate of the transportation requirements of the principal commodities is drawn up each quarter year by the thirteen or fourteen Shippers Regional Advisory Boards, which were specially constituted to advise the railways about trade developments and to assist them to use the available supply of cars to the greatest advantage. On the basis of these forecasts the Car Service Division calculates the number of cars required in each region for each principal commodity. After the requirements are thus determined, the Advisory Boards work with the railways in speeding up the turn round of trucks and in getting them sent to the places of greatest demand. If the worst occurs and a traffic block takes place, as happened during the Florida boom, the wagons are rationed as fairly as can be managed.

This special treatment has been made necessary in the United States by the vast distances and the great tonnages involved. In Great Britain the various control systems seem well able to fulfil their duty of keeping trace of all wagons and minimising the disorganising effects of seasonal fluctuation of demand.

An International Sports Service

For more than 50 years the name *Spalding* has been synonymous with Sports Service, but the firm's newest idea in catering for their customers is likely to prove the most helpful they have ever introduced.

Spalding's have 75 retail branches in Great Britain, Australia, Canada, New Zealand, South Africa, Belgium, France, and the United States, in addition to fully equipped agencies in other parts of the world. At each of these depots experts are available to give assistance and advice on everything of a sporting character. For instance, at every branch the latest information is available of the local tennis, golf or other sports clubs and of all forthcoming interesting sporting events.

As a passport to this remarkably complete service scheme, Messrs. Spalding are issuing to their customers on their application an identification card, the simple production of which will secure for the holder the benefit of the firm's service in any part of the world.

Messrs. Spalding have also set aside 100 neat gold and blue enamel buttonhole badges, which give the same privileges as the passports for the first 100 "*M.M.*" readers who apply, enclosing a 1½d. stamped addressed envelope for reply purposes. Applications should be sent to Messrs. A. G. Spalding & Brothers Ltd., Putney, London, S.W.15.

Colour in Photography

A new booklet published by Burroughs Wellcome and Co., entitled "*Colour in Photography*," provides interesting information on the value and use of panchromatic emulsions. The question of correct colour rendering in monochrome is one that appeals to every serious photographer, and the booklet shows how simple it is to secure good results.

A chart demonstrates how colours are recorded by the ordinary and by the panchromatic plate, and other illustrations show the strikingly different results given by these two types of plates. Other sections show how toners and stains may be used to give further improvements in the rendering of special subjects. The booklet can be obtained from Burroughs Wellcome and Co., G.P.O. Box No. 213A, London.

NEWS from H·R·C BRANCHES

Branch Notes

West Kent.—A stand was allotted to this Branch at the Beckenham Meccano Club's Exhibition, and a Hornby *"Flying Scotsman"* electric locomotive and two Pullman coaches ran throughout the evening. A fifty-year-old model of a locomotive proved a great attraction. The Branch layout has been reconstructed, and includes a model of a mountain through which four tracks pass. Accommodation is provided under the mountain to allow a member of the staff to wind up the locomotives. Secretary: F. R. Duberry, 48, Reddons Road, Beckenham, Kent.

First Kingston-on-Thames.—Interesting experiments have been made with a dynamometer car built by the secretary. At one meeting a talk was given by the Branch Chairman, Captain F. J. Browne, R.A.O.C., on interesting railway experiences during the War. Visits have been paid by Branch members to King's Cross, St. Pancras, Euston, Baker Street, Paddington and Victoria Stations. Secretary: C. W. Lex, 19, Richmond Park Road, Kingston-on-Thames.

Whitstable.—An interesting speed truck loading competition was held with a crane built by the Chairman. A shunting competition was also held, the object being to wind the locomotive only enough to run round a portion of track and shunt some coaches into a siding. At one meeting a Morse tapper and buzzer were fitted for sending messages concerning the trains being run. A handicrafts meeting was held during which a 3 ft. platform, bridges, buildings and numerous accessories were made by members. Secretary: L. C. C. Armstrong, 50, Acton Road, Whitstable, Kent.

Wimborne Grammar School.—A general meeting was held and a new committee elected. Members were detailed as track inspectors, repairers, enginemen and scenic specialists. A visit has been paid to the carriage works at Eastleigh. Members watched with great interest brake beams being stamped into shape by steam hammers; they were taken through the carriage shops, and found the upholstering and polishing shops very fascinating. The power and speed of the locomotives of the Branch are to be tested as soon as possible. Several photographs have been taken of the Branch layout. Secretary: J. K. Bennett, 120, Newington Causeway, Southwark, London, S.E.1.

Weston-super-Mare.—Regular meetings have been abandoned until September, but members meet frequently in the evening at Worle Junction, where trains hauled by engines of the "Hall" and "King" classes can be seen between 6.30 and 8 p.m. In addition to the names and numbers of locomotives, members collect the numbers of un-named locomotives, restaurant cars and brake vans, and in the case of the last-mentioned, the sheds at which they are kept. Secretary: Cedric E. Hyssett, 6, Elmhyrst Road, Weston-super-Mare.

Some members of St. Andrew's Church (Cobham) Branch, No. 147. Chairman, the Rev. I. W. Moir; Secretary, A. West. This Branch is enjoying a very varied summer programme comprising indoor and outdoor track meetings, frequent visits of railway interest and cricket matches.

Aldershot and District.—Branch layouts are run to timetable, and at a recent meeting 10 engines and 30 trucks were successfully operated. Model-building competitions are being held and a recruiting campaign is being organised. A prize will be given to the member who introduces the most new members in a given period. A paper chase was held during the month, in which cyclists and runners took part. Secretary: M. Charles, "Bandon," Church Hill, Aldershot, Hants.

Portsmouth (North End).—The Branch track has been ballasted and looks very realistic. Colour light signalling is being installed. Experiments have been made with double heading, and trials for speed and haulage have been carried out. An exhibition is to be held on the 4th, 5th and 6th of this month. An outing to Petersfield also has been arranged. Secretary: Denis Cole, 90, Emsworth Road, North End, Portsmouth.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

Accrington—E. Priestley, Holly Place, Accrington.

Ashton-on-Ribble—John A. Seed, 2, Hastings Road, Ashton-on-Ribble, Preston.

Barnet.—Alex. Comfort, "Havengore," Tudor Road, Barnet.

Birmingham—Ronald Yoxon, 51, Onibury Road, Handsworth, Birmingham.

Blairgowrie—Donald M. Grassick, "Littlewood," Rosemount, Blairgowrie.

Carlisle—J. Taylor, School House, Furze Street, Carlisle.

Diss—L. R. Youngs, 5, Sunnyside, Diss, Norfolk.

Hanley—Mr. C. O. Ikin, 16, Lower Mayer Street, Hanley, Stoke-on-Trent.

London, E.9—D. J. Lewer, 92, Gore Road, South Hackney, London, E.9.

Stevenston—Mr. Matt. Fitzpatrick, 15, Station Road, Stevenston, Ayrshire.

Worthing, E.—R. Jupp, 1, Brougham Terrace, Brougham Road, E. Worthing.

Further Incorporated Branches

183. Slough and South Bucks—Mrs. F. E. Hare, "Wyleigh," Windsor Road, Slough, South Bucks.

184. Ilkeston and District—F. Caddick, "Woodthorpe," Catherine Avenue, Ilkeston, Derby.

185. The Towers (Cockermouth)—Robert Pattinson, "The Towers," Cockermouth, Cumberland.

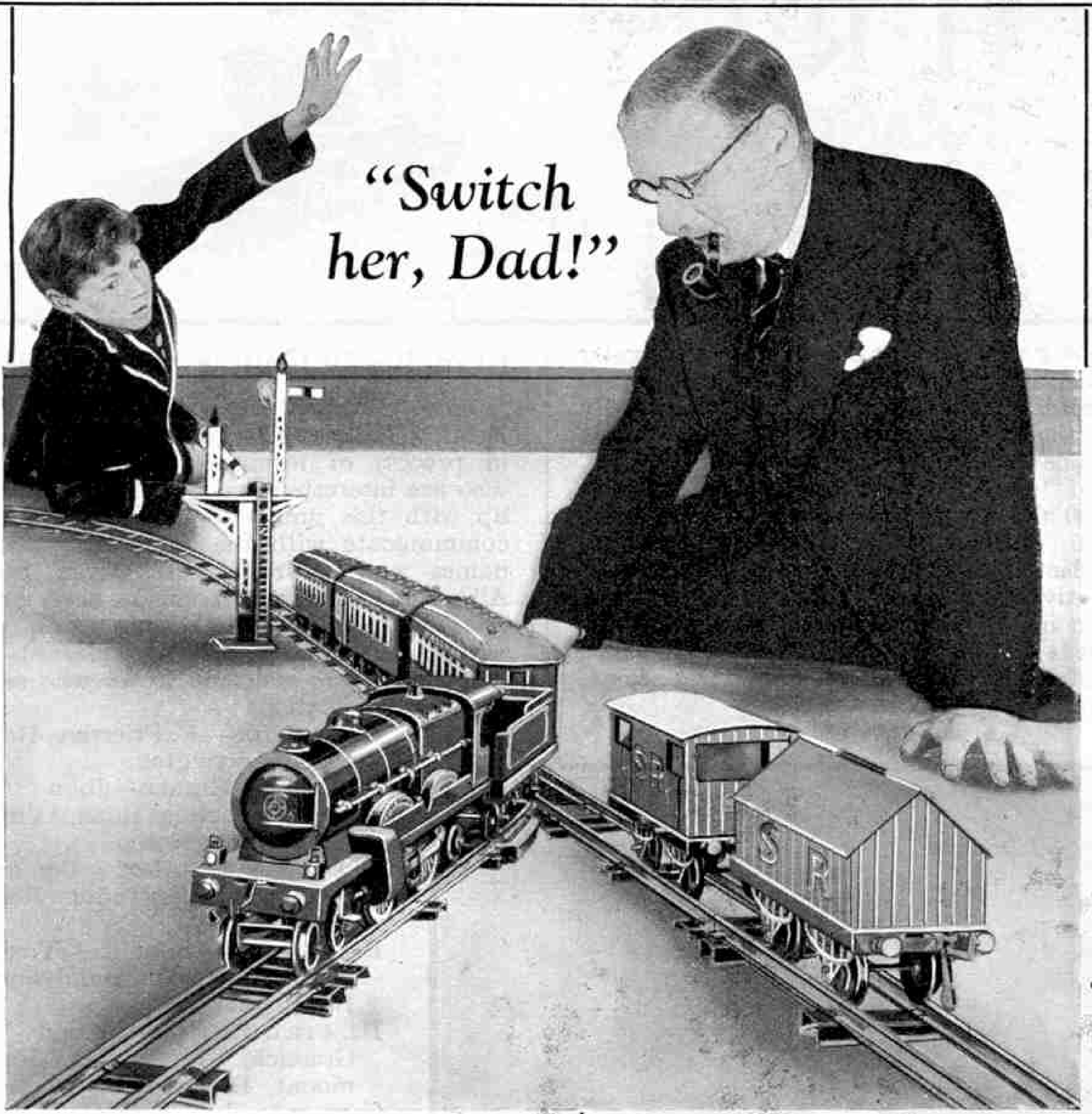
187. "Brentwood" (Hitchin)—T. J. Hoare, "Brentwood," Queen Street, Hitchin, Herts.

188. Worthing—Patrick W. Feltham, 127, Dominion Road, Worthing, Sussex.

OVERSEAS

186. Annandale (Brighton)—Andrew Jack, 33, Normanby St., Brighton, S.5., Melbourne, Victoria, Australia.

POINTSMAN'S SKILL PREVENTS CRASH


"Switch her, Dad!"

Dad will be prepared for all kinds of commands when he has given you a Hornby Train and you have given him a job on the permanent way. The great game of railways is the most thrilling in the world—there will never be a single dull moment when you and Dad are managing your own line.

Hornby trains are the finest trains that you can buy. The Locomotives are built for heavy loads and long runs; the Rolling Stock is strong, smooth-running and durable; the Accessories are realistic and correct in proportion, while every part is made of the finest material, by British craftsmen.

Tell Dad what you think of these fine models of modern engines and rolling stock. Tell him what every boy knows—that Hornby Trains are the best, strongest, and most efficient model trains in the world.

Ask your dealer for a complete illustrated price list of Hornby Trains, Rolling Stock and Accessories.

PRICES OF HORNBY TRAINS

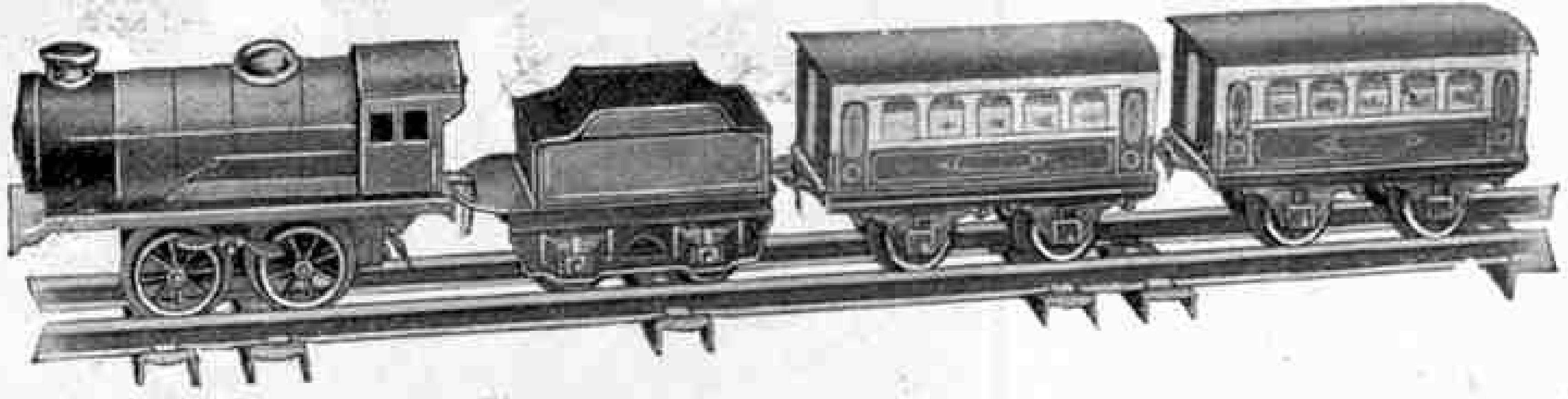
CLOCKWORK

M0 Goods Set	5/-
M0 Passenger Set	5/9
M1 Passenger Set	9/3
M1 Goods Set	10/-
M2 Passenger Set	10/9
No. 0 Goods Set	15/-
,, 0 Passenger Set	15/-
,, 1 Goods Set	20/-
,, 1 Tank Goods Set	22/6
,, 1 Passenger Set	25/-
,, 1 Special Goods Set	32/6
,, 1 Special Passenger Set	35/-
,, 2 Mixed Goods Set	40/-
Metropolitan Train Set C	45/-
No. 3C Train Set. Riviera "Blue" ...	62/6
,, 2 Special Pullman Set	67/6
,, 3C Train Sets. "Flying Scotsman," "Royal Scot," "Cornish Riviera" or "Golden Arrow"	67/6

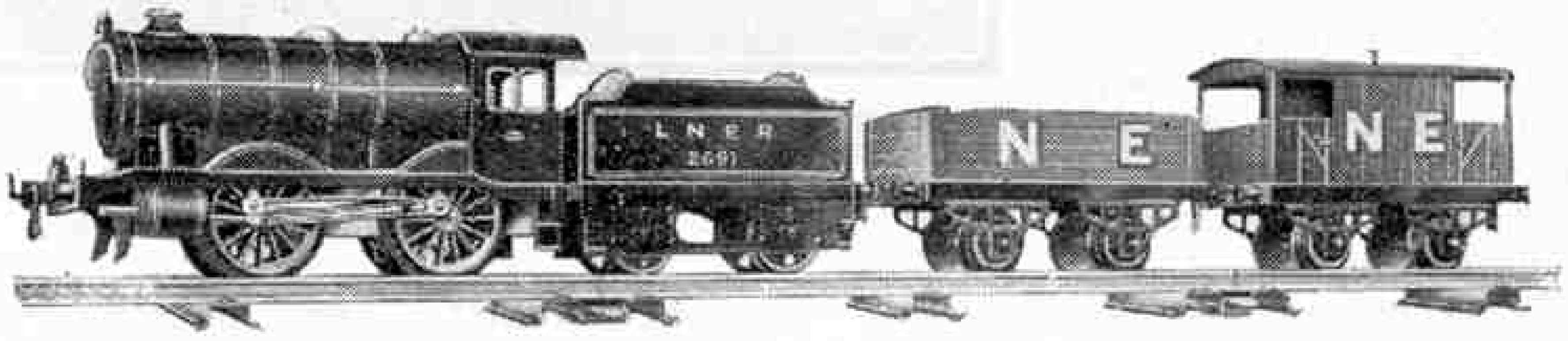
ELECTRIC

No. 3E Train Set. Riviera "Blue" (6-volt)	80/-
,, 3E Train Sets (6-volt). "Flying Scotsman," "Royal Scot," "Cornish Riviera" or "Golden Arrow"	85/-
Metropolitan Train Set, L.V. (6-volt) ...	85/-

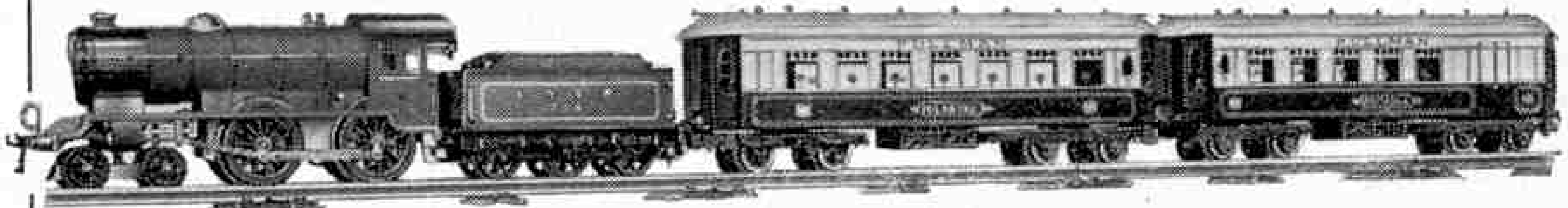
A Selection of Hornby Train Sets



M0 Passenger Train Set ... ... Price 5/9



Hornby No. 1 Special Goods Train Set ... ... Price 32/6



Hornby No. 2 Special Pullman Train Set L.N.E.R. ... ... Price 67/6

HORNBY TRAINS

BRITISH AND GUARANTEED

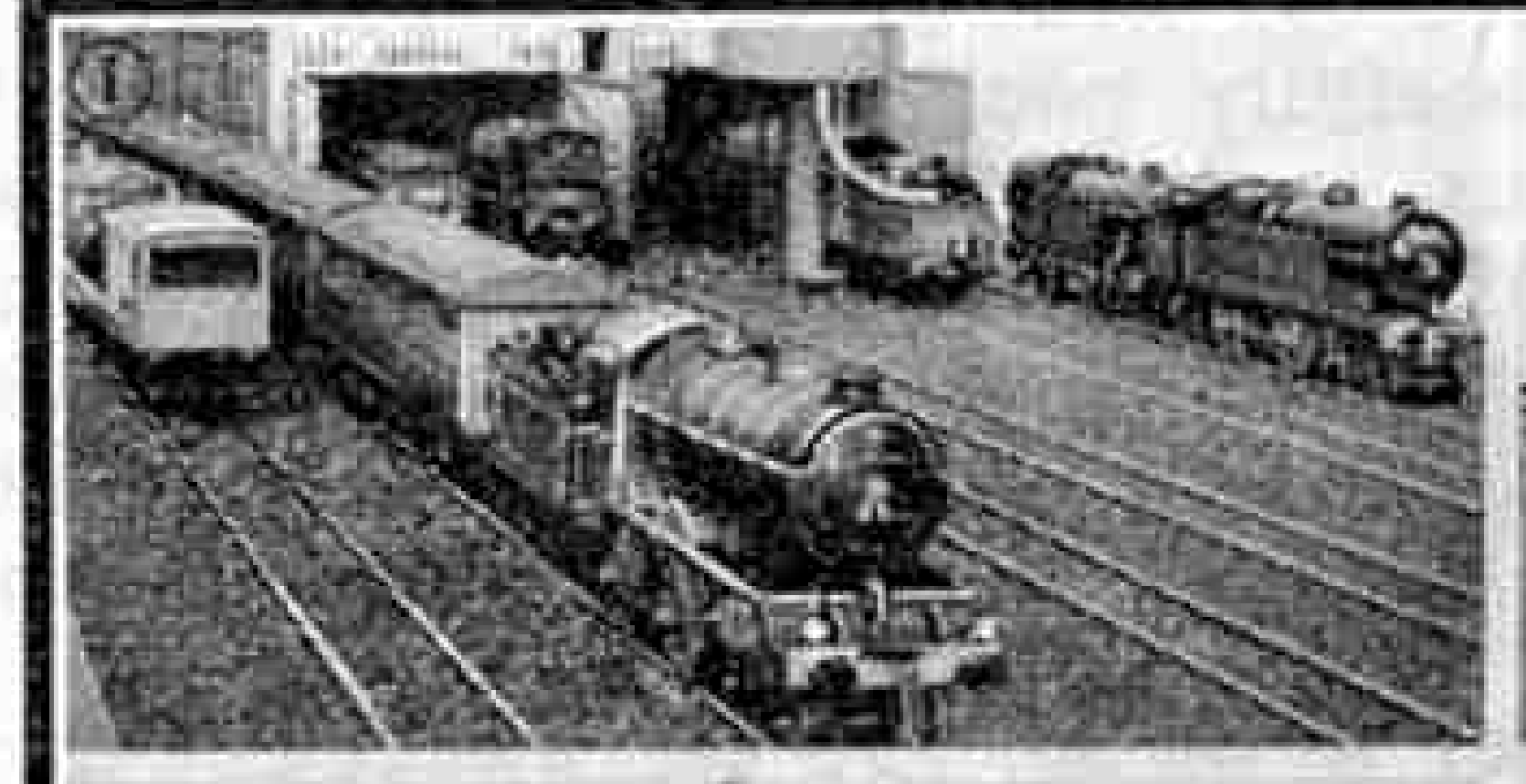
Manufactured by MECCANO LTD., OLD SWAN, LIVERPOOL

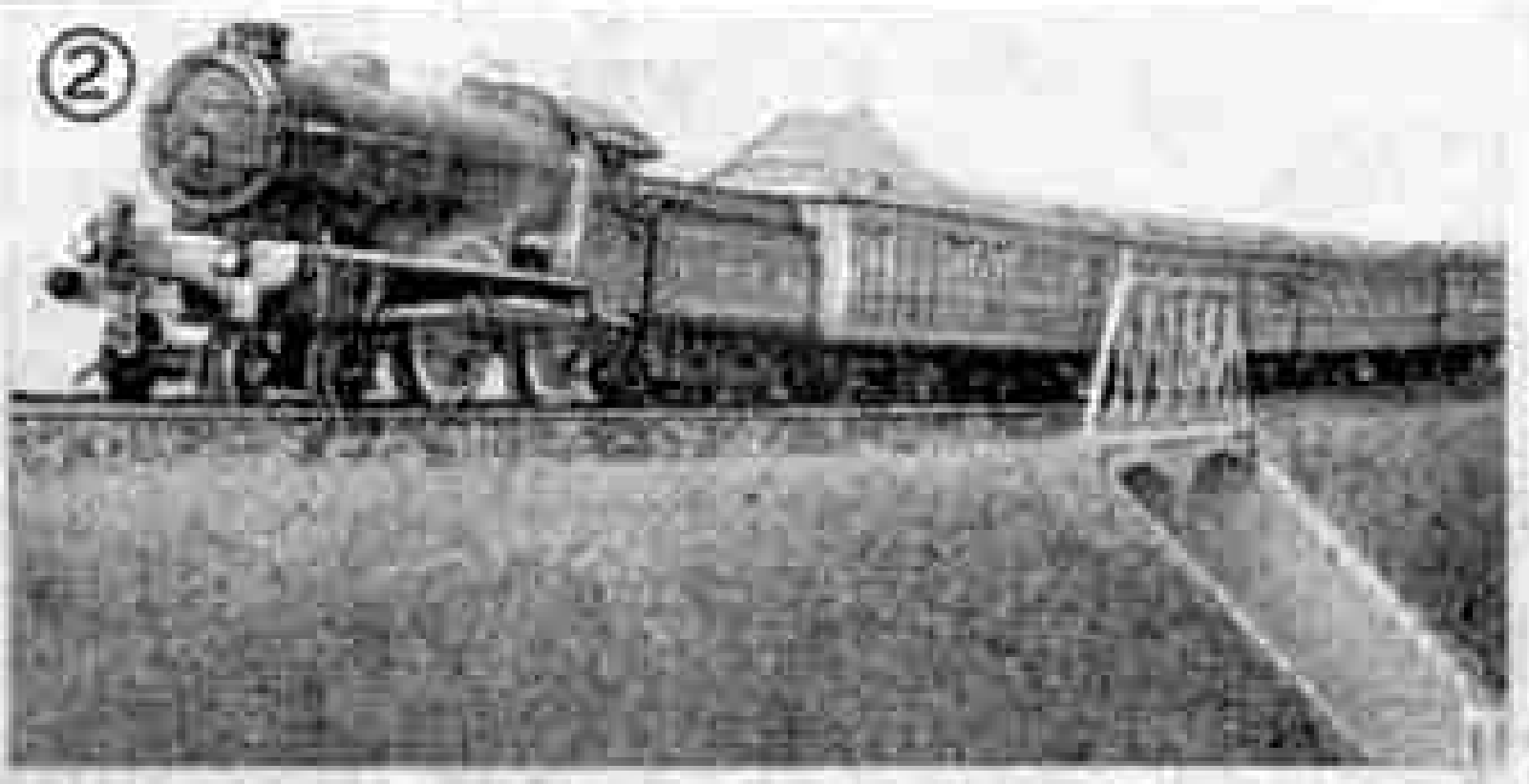
H.R.C. COMPETITION PAGE

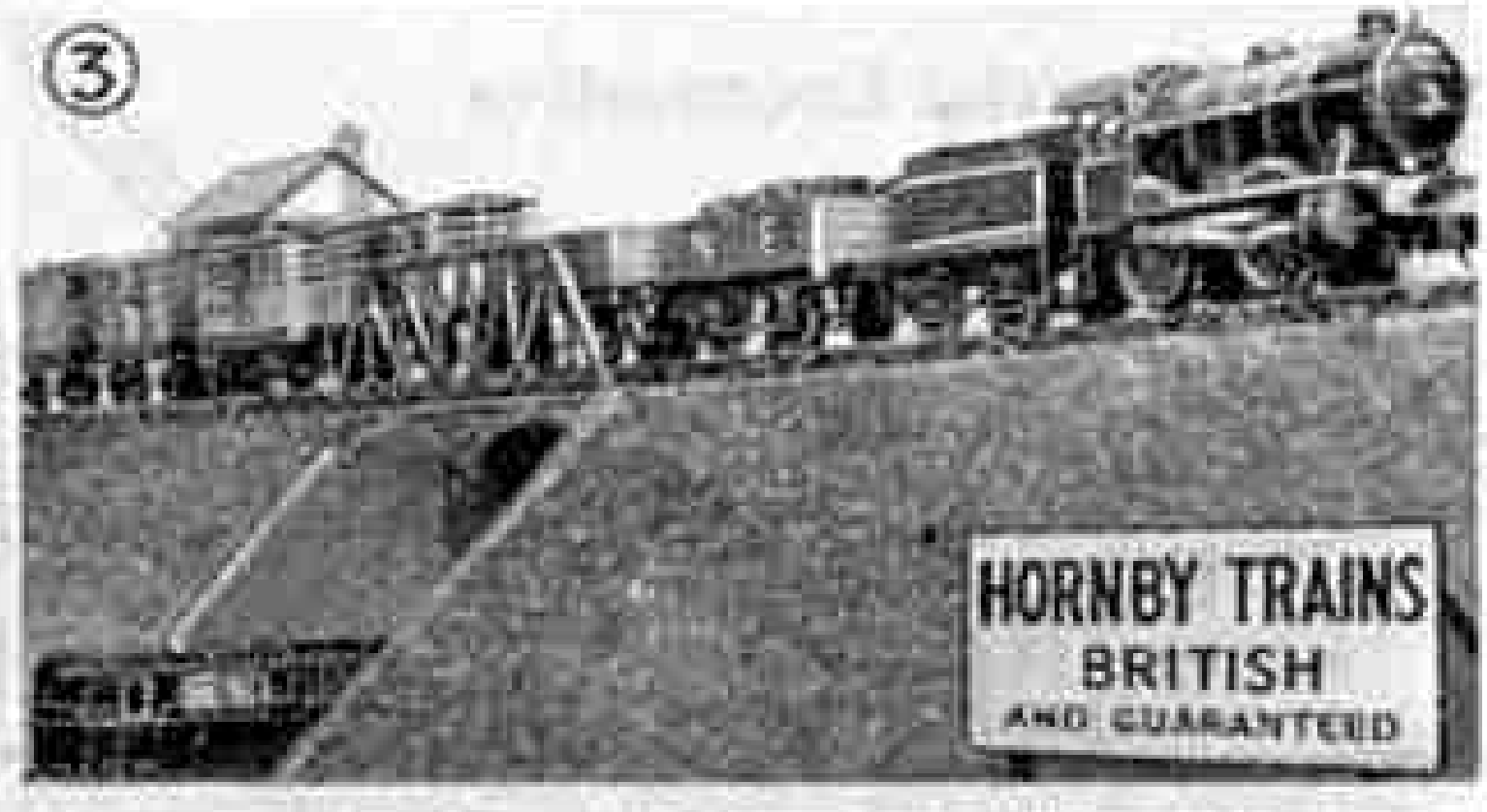
Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries, should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

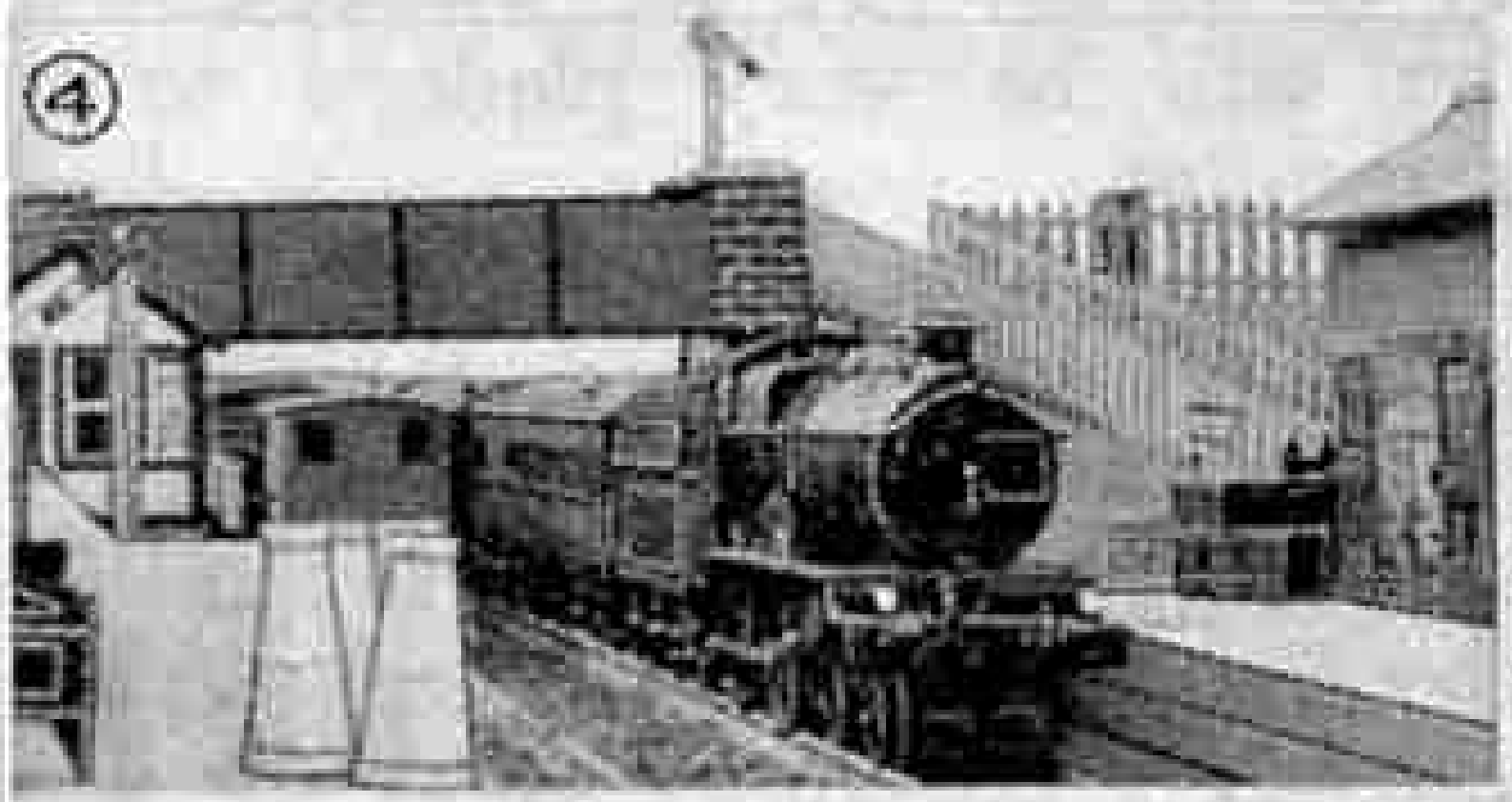
MODEL RAILWAY PHOTOGRAPH VOTING CONTEST

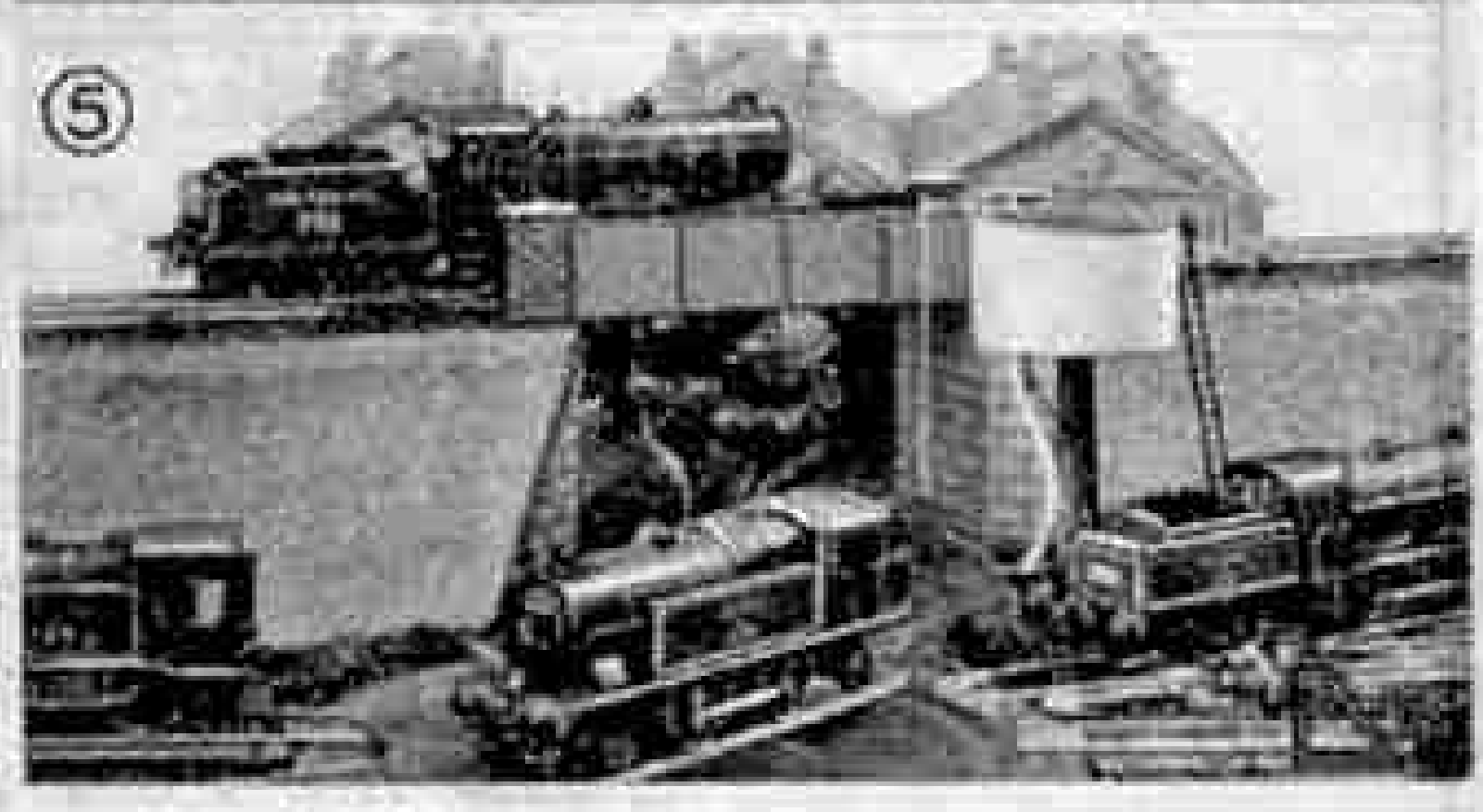
DURING the past three years there have appeared in the H.R.C. pages of the "*M.M.*" large numbers of photographs illustrating various points of model railway practice, and showing how the greatest possible interest and enjoyment can be obtained from a Hornby railway. These photographs have attracted widespread attention on account of their remarkable realism, not only in the actual railway arrangements depicted but also in the various scenic effects that are introduced.

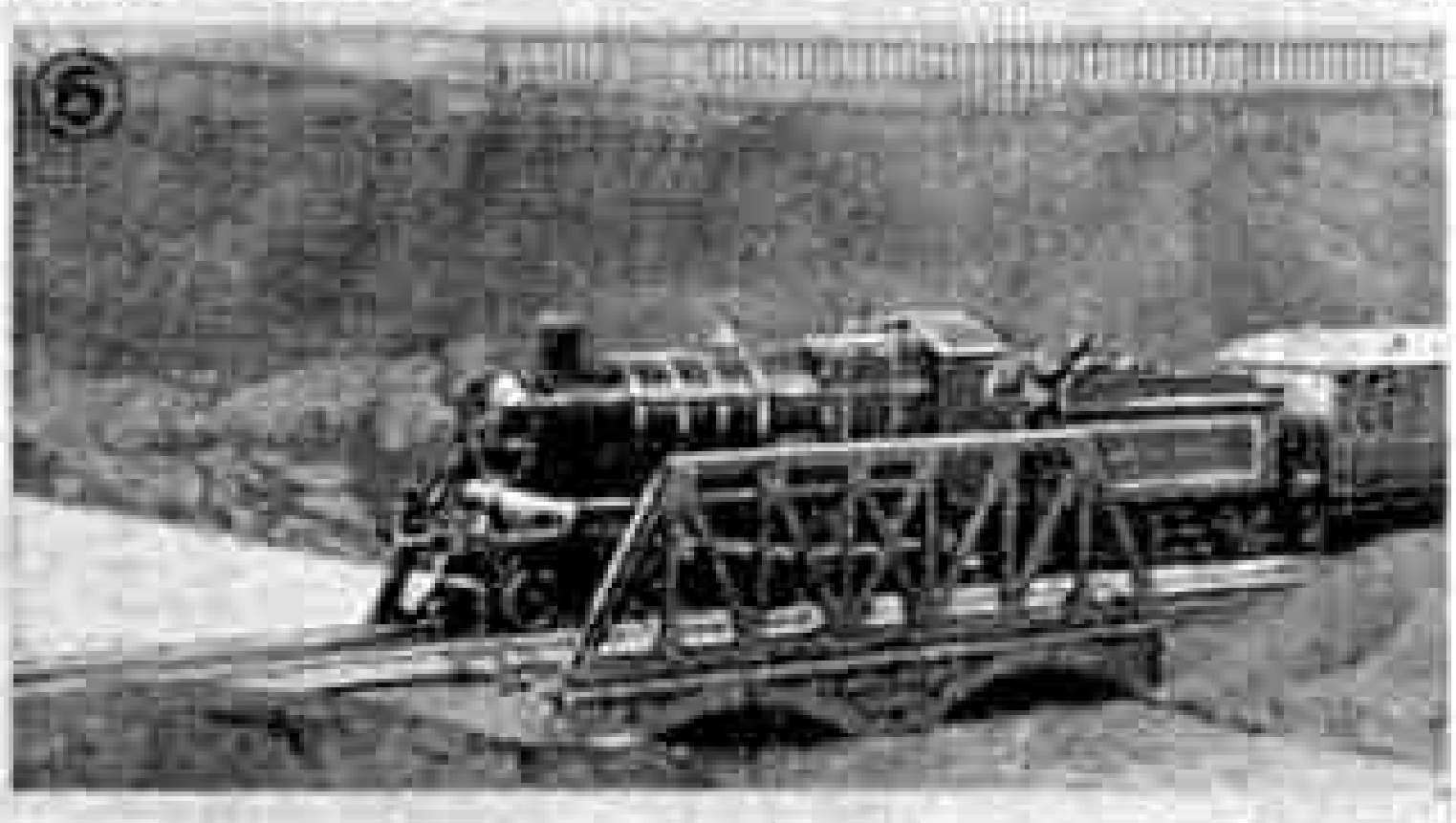


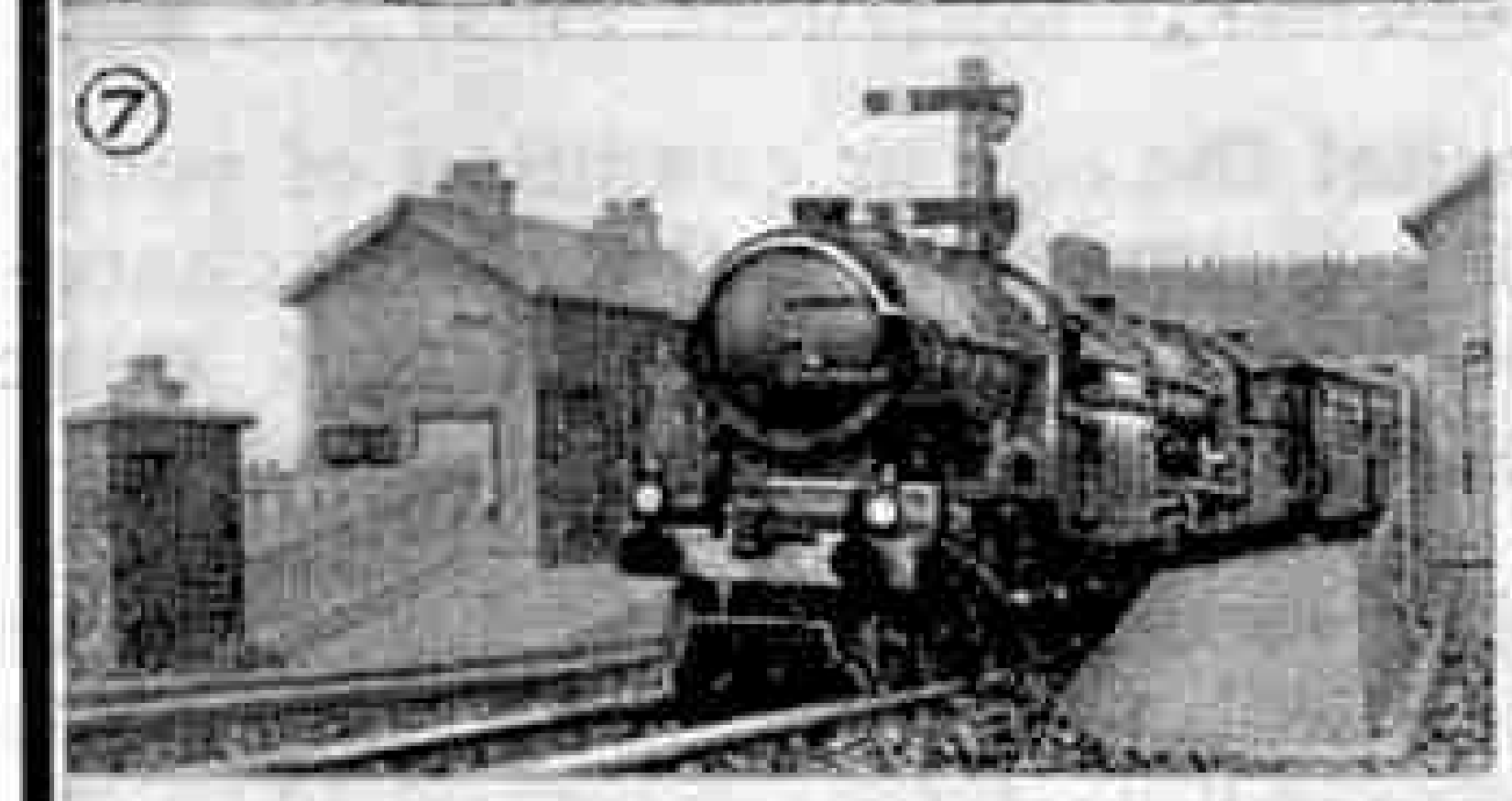


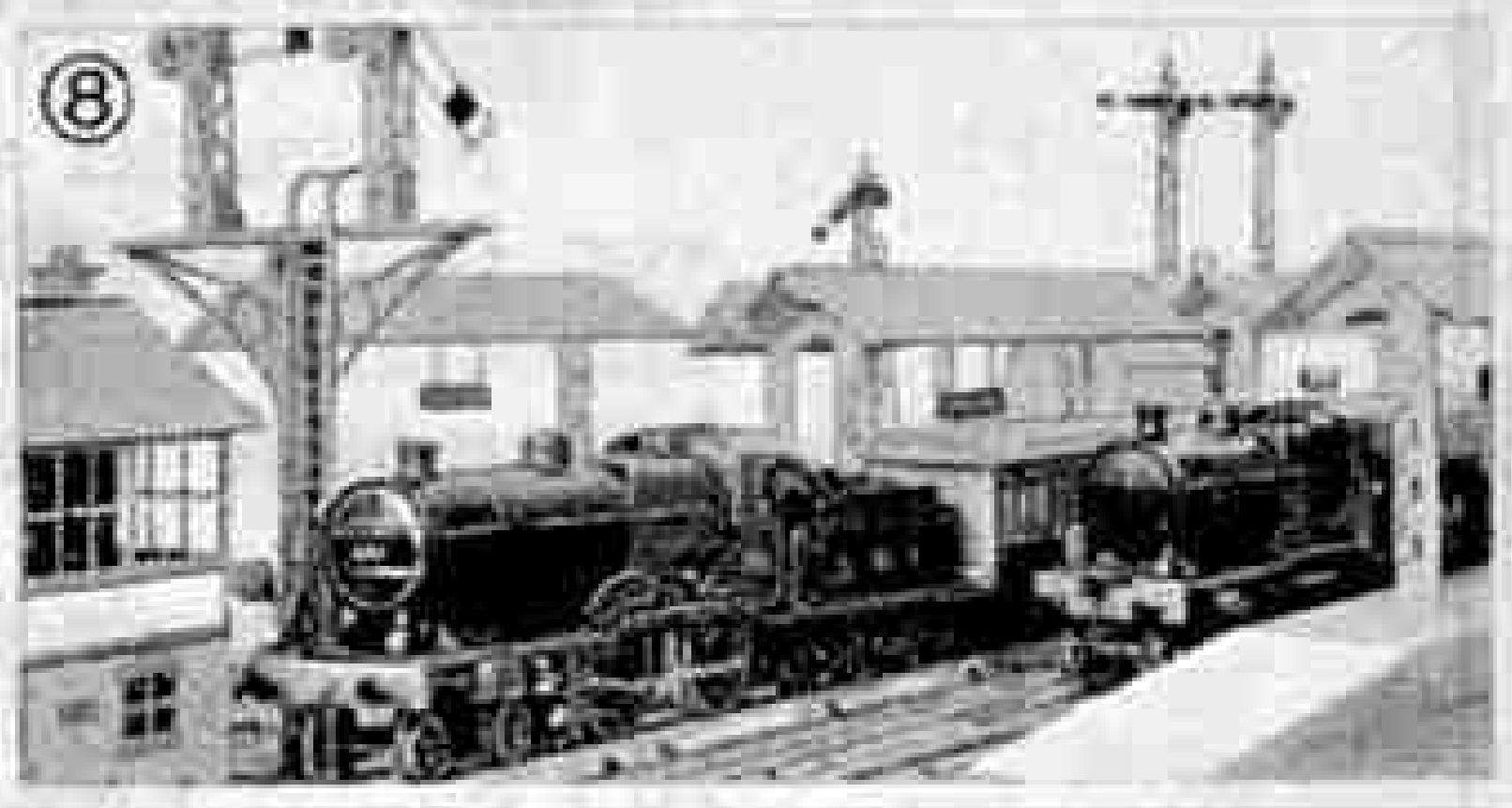


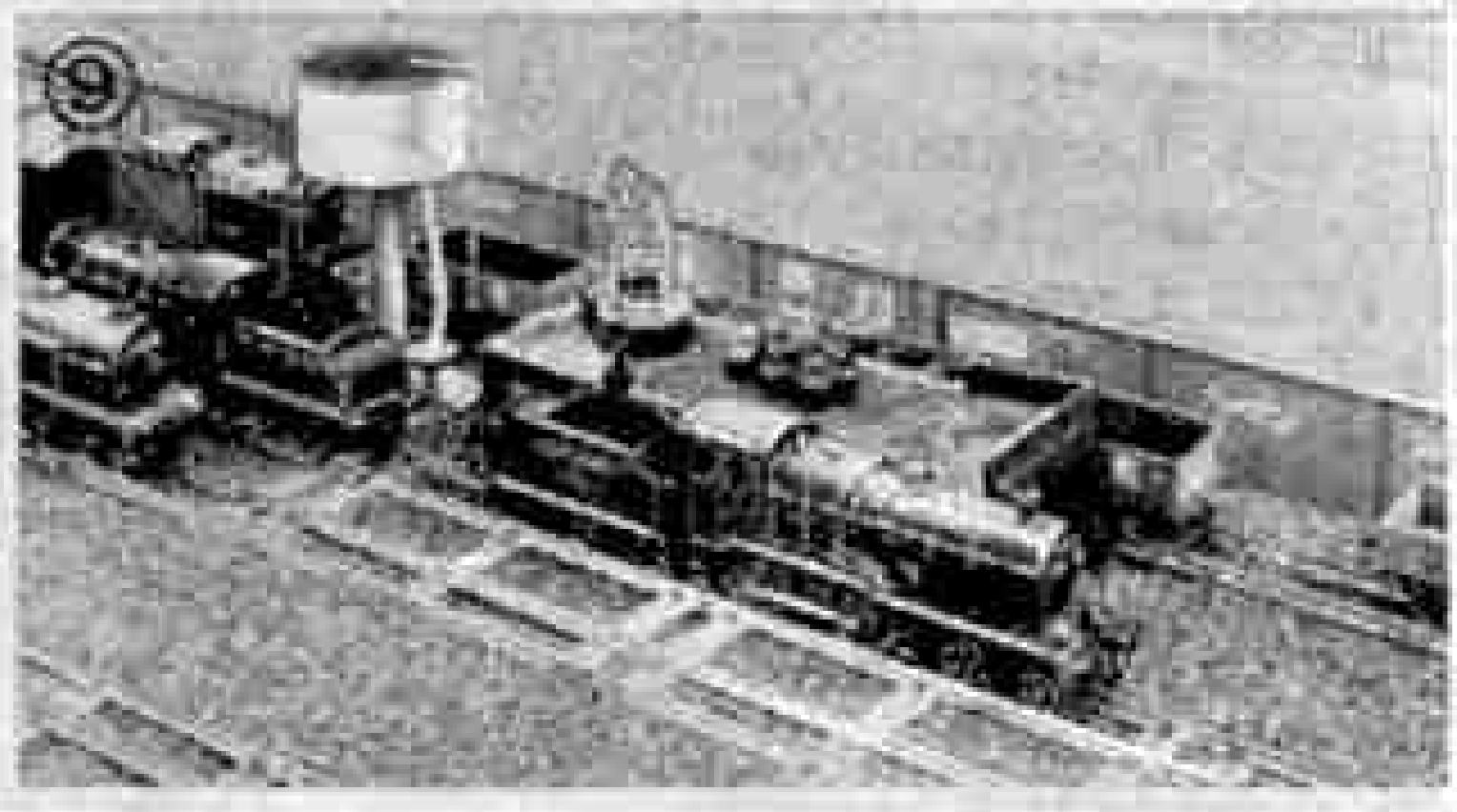


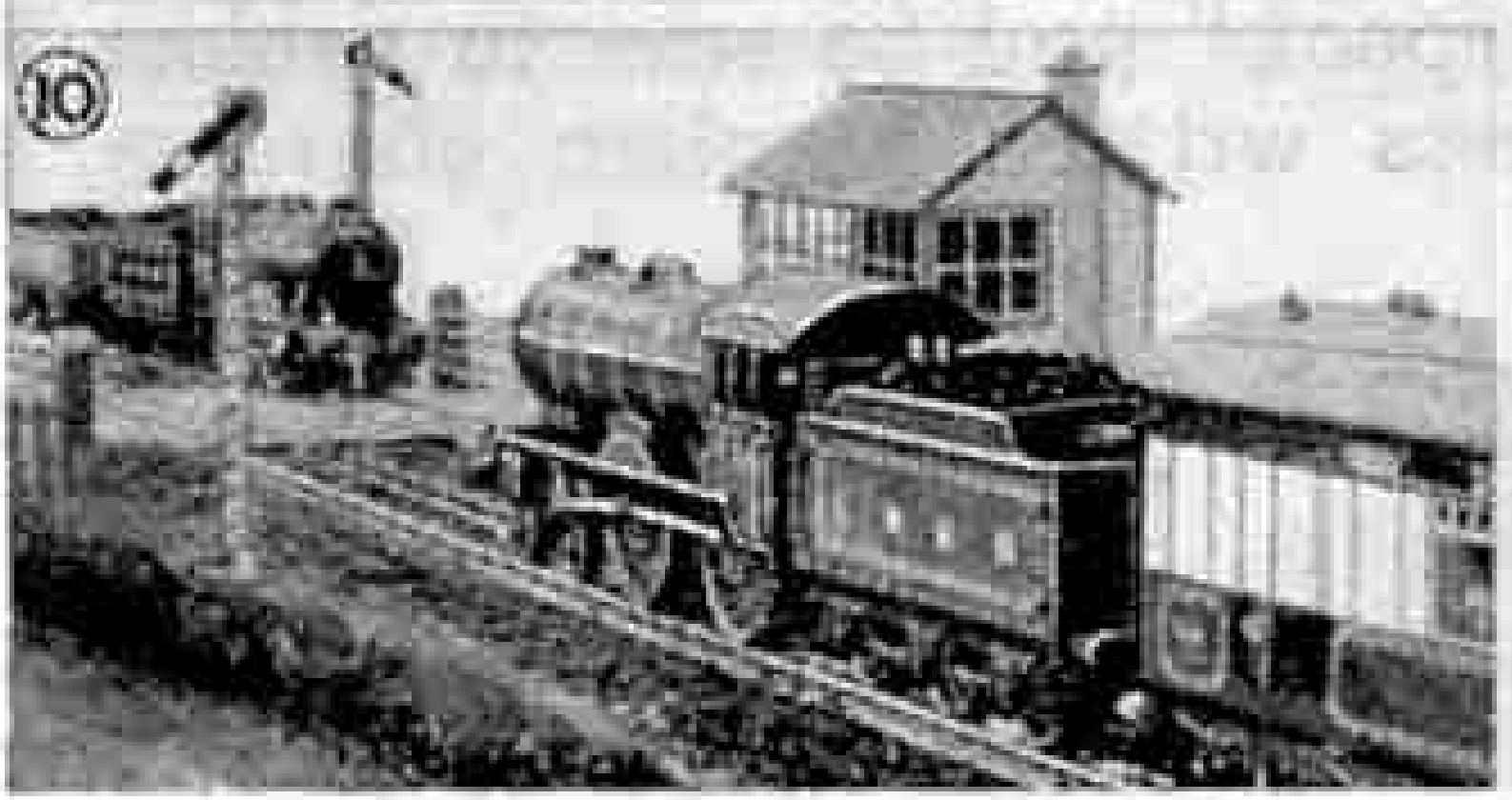


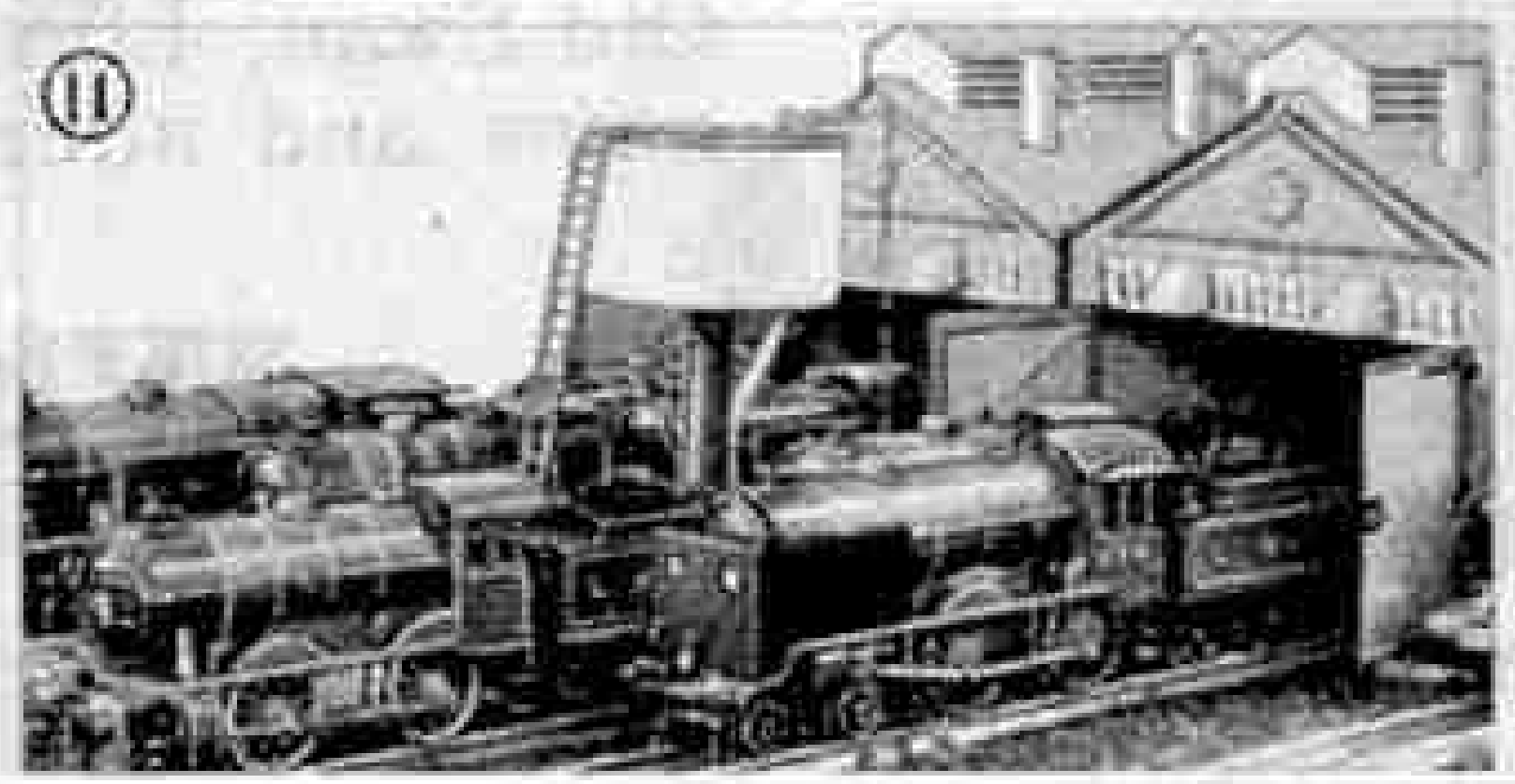


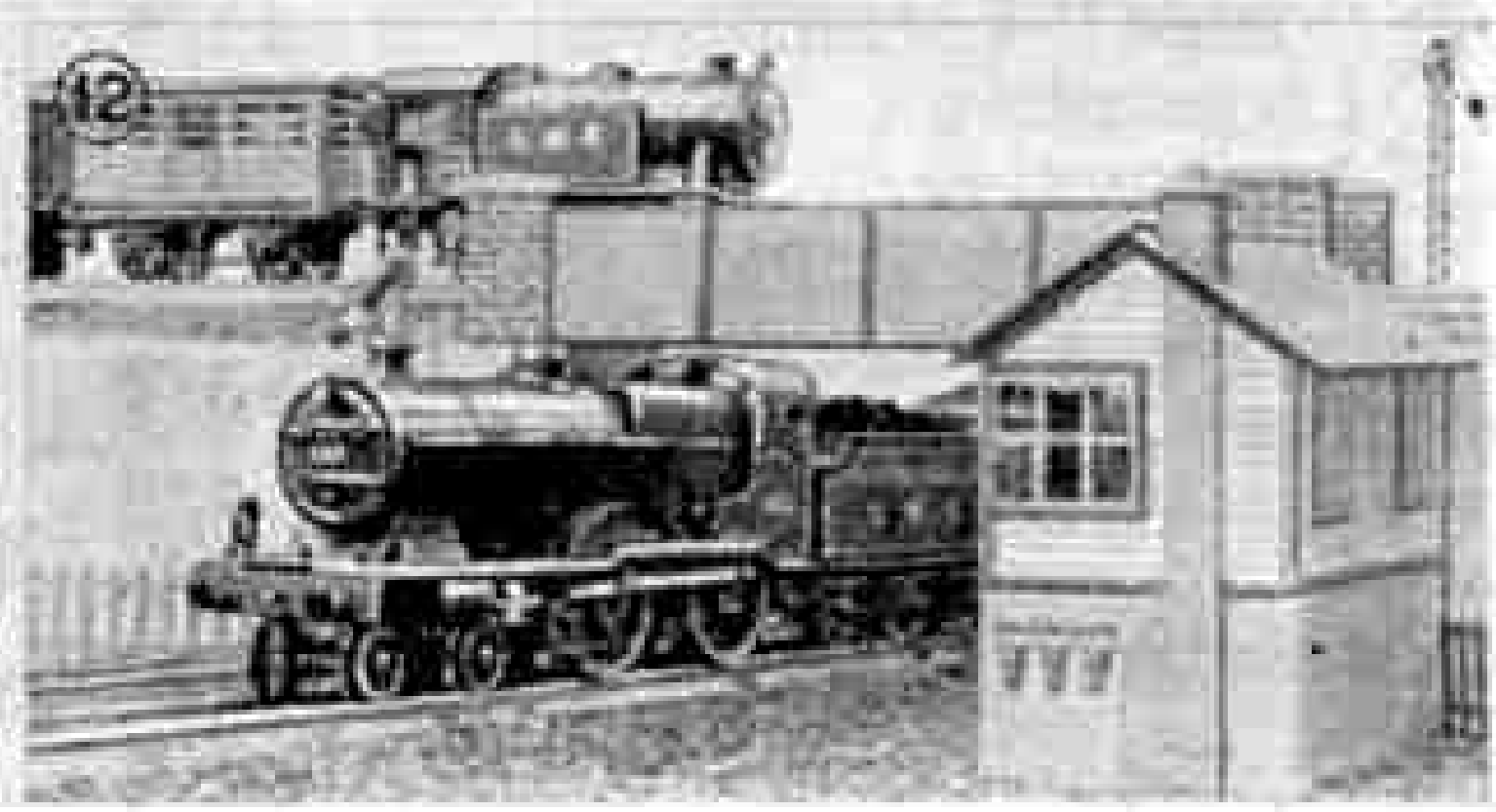












Our correspondence shows that these illustrations have been of the greatest value to model railway owners and have resulted in large numbers of model railways being entirely reconstructed on railway-like principles. The subjects dealt with in the photographs are very varied and we should like to know which are the most popular. In order to ascertain this we reproduce this month twelve recent and typical examples of Hornby railway photographs, and we invite readers to place these in order of merit according to their own personal views.

Competitors are required to do two things. First, they must decide upon the order in which they think the photographs should be placed and make a list of the numbers accordingly. Second, they must state their reason for selecting the particular photograph that they have placed first in the list. There is no reason for this to be stated at great length. All that is necessary is to make it quite clear why the photograph in question was selected as being the most interesting of the series.

Prizes of Hornby Railway (or Meccano) goods to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four competitors whose lists most accurately forecast the total vote of all the competitors. In the event of a tie for any of the prizes preference will be given to the neatest or most novel entry. In addition there will be a number of consolation prizes.

Envelopes containing entries should be marked H.R.C. "*Photograph Voting Contest*" and posted to reach Headquarters at Meccano Ltd., Binns Road, Old Swan, Liverpool, on or before 31st August. Closing date for the Overseas Section, 30th November.

On all entries in this competition should be clearly stated the entrant's H.R.C. membership number, omission of which will result in immediate disqualification.

Summer Photo Contest

More railway photographs are taken at this time of the year than at any other. Not only is the light at its best, but also most of us make railway journeys to seaside or other holiday resorts, and consequently have opportunities of photographing unfamiliar and therefore interesting railway scenes. Last year we received many excellent photographs from H.R.C. members, and this year we hope to have a still greater number. In order to encourage readers to send us their prints we offer this month prizes for *The Most Interesting Railway Photograph, Accompanied by a Description Not Exceeding 100 Words.* Readers may submit more than one photograph if they desire, but no competitor will be awarded more than one prize. It is worth while to send in two or three photographs, however, as this naturally increases the chances of winning.

Prizes consisting of Hornby or Meccano products to the value of 15/–, 10/6, 5/– and 2/6 respectively will be awarded to the senders of the four most interesting photographs. In the case of a tie for any prize the railway interest of the subject chosen will be the deciding factor. A number of consolation prizes also will be awarded. On the back of each photograph and its accompanying description should be written the competitor's name and full address, together with his H.R.C. membership number. Envelopes containing entries should be marked H.R.C. "Summer Photo Contest," and posted to reach Headquarters at Meccano Limited, Binns Road, Old Swan, Liverpool, on or before 31st August. The closing date for Overseas competitors is 30th November.

COMPETITION RESULTS

HOME

May "Third Name and Number" Contest.—First: G. E. Waters (20630), Southall, Middlesex. Second: D. Holder (8613), Leicester. Third: L. A. Strudwick (2651), Harborne, Birmingham. Fourth: J. F. B. Stevens (8694), Kingston-on-Thames.

May "Electric" Contest.—First: R. E. Bradfield (3970), Didcot, Berks. Second: H. Taylor (16637), Gerrards Cross, Bucks. Third: W. G. Guest (18271), Purley. Fourth: D. Plumb, Gt. Berkhamsted.

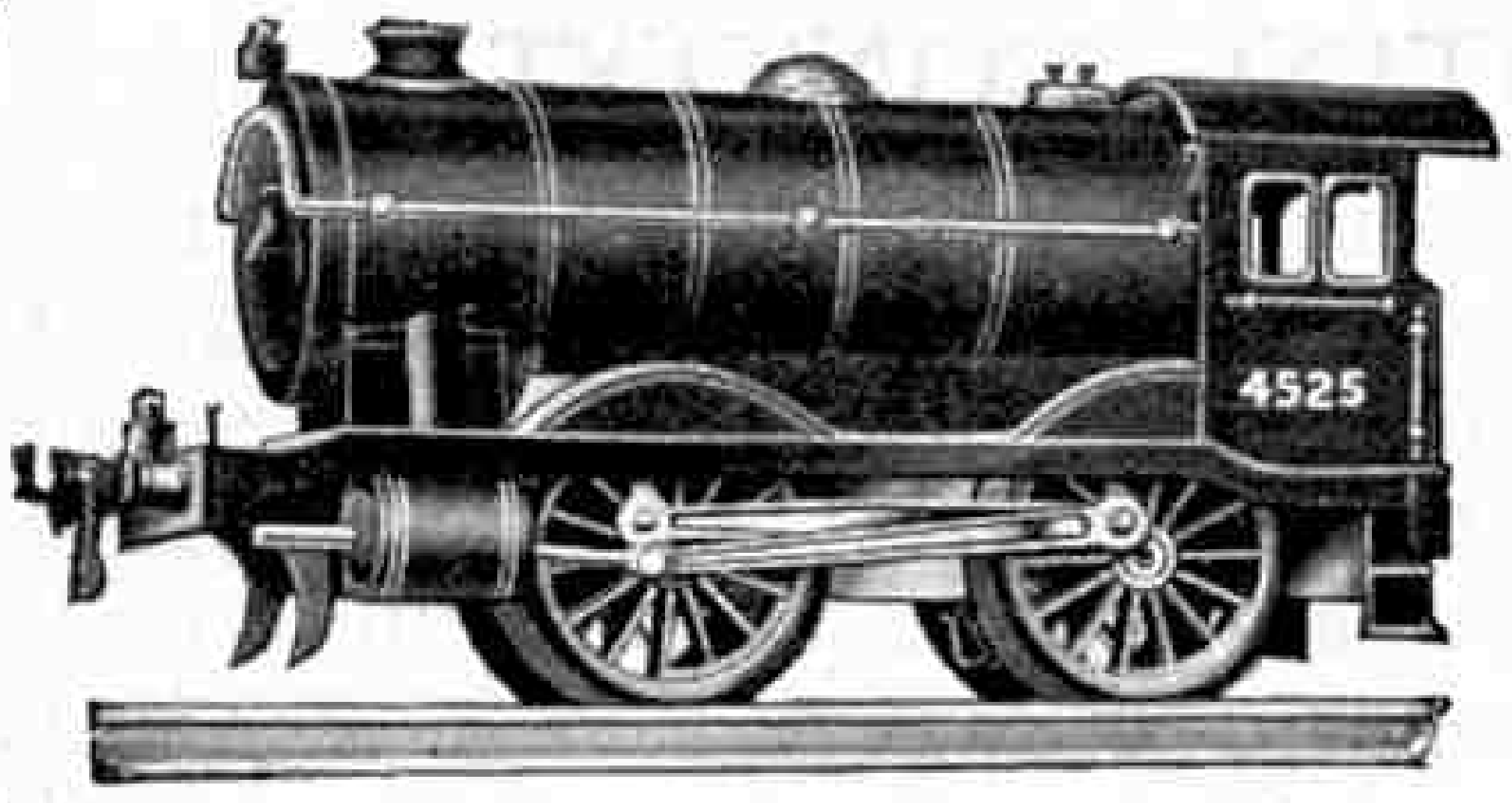
May "Electric Locomotive" Drawing Contest.—First: E. A. Smith (18407), Moreton, Wirral. Second: G. A. Nix (2993), Mickleover, Nr. Derby. Third: L. Belk (20414), Sefton Park, Liverpool. Fourth: J. P. Gardner (14761), Colnbrook, Slough.

OVERSEAS

February "Word-finding" Contest.—First: A. G. Saunders (9822), Hamilton, N.Z. Second: R. B. McMillan (9592), Melbourne, Australia. Third: P. Nicholls (7880), Papanui, Christchurch N.Z. Fourth: A. B. J. Reid (14843), Cape Town, S. A.

February "Railway Drawing" Contest.—First: F. Whyte (17289), Ipswich, Queensland, Australia. Second: O. Dose (15307), Cape Town, S. Africa. Third: A. Johnstone (16298), N.S.W., Australia. Fourth: V. East (21196), E. Fremantle, Australia.

BOYS! Here is a plan to secure a fine new Hornby Locomotive



Hornby No. 1 Special Locomotive

Part Exchange Allowances for Hornby Locomotives

CURRENT TYPES	
M2930 Locomotive...	1/-
M0 Locomotive	1/4
M1/2 Locomotive No. 3031	2/3
No. 0 Locomotive	5/3
No. 1 Tank Locomotive	6/3
No. 1 Locomotive	6/3
No. 1 Special Locomotive	8/3
No. 1 Special Tank Locomotive	8/3
No. 2 Special Locomotive	11/3
No. 2 Special Tank Locomotive	11/3
No. 1 Electric Tank Locomotive, Permanent Magnet	12/6
No. 2 Electric Tank Locomotive	18/9
No. 3E Locomotive	18/9
No. 3E Riviera " Blue " Locomotive	18/9
No. 3C Locomotive	13/9
No. 3C Riviera " Blue " Locomotive	13/9
Metropolitan C Locomotive	11/3
Metropolitan E Locomotive	20/-
OBSOLETE TYPES	
George V Locomotive No. 00 Locomotive { These models were identical }	3/3
M3 Locomotive	4/3
Zulu Locomotive	5/3
Zulu Tank Locomotive	6/3
No. 2 Locomotive	10/-
No. 2 Tank Locomotive	11/3
No. 1 Locomotive, fitted for Hornby Control	7/6
No. 1 Tank Locomotive, fitted for Hornby Control	7/6
No. 2 Locomotive, fitted for Hornby Control	11/3
No. 2 Tank Locomotive, fitted for Hornby Control	12/6
Metropolitan E Locomotive	20/-

You have probably been using a Hornby Locomotive for some years and would like to own one of the fine new models that now figure in the Hornby Catalogues. The object of the new Hornby Locomotive Part Exchange Scheme is to help you to do this.

First of all, carefully study the latest Hornby Train Catalogue, and select the new up-to-date Hornby Locomotive you want; then carefully pack up your old Hornby Locomotive and post it to us, enclosing your order for the new one and the necessary remittance. You can easily ascertain how much to send by deducting the part exchange allowance indicated in the accompanying list from the price of the new Locomotive, and adding 1/- for postage on the new model you purchase.

If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you all the information you require.

The allowance that will be made for your old Locomotive is shown in the list of Part Exchange allowances for Hornby Locomotives given on this page. Please note that the catalogue price of the new Hornby Locomotive you purchase *must not be less than double the Part Exchange allowance made for your old Locomotive.*

No matter what the age or condition of your old Locomotive, you can exchange it under our " Part Exchange " plan. It is important to note that we cannot accept more than one old Locomotive in exchange for a new Locomotive.

If you decide to send your old Locomotive to us address your parcel to " Special Service Department, Meccano Limited, Old Swan, Liverpool," and be sure to enclose with it your own name and address written in plain characters.

What you have to do

Here is an example of how the plan works. Assuming you have a No. 1 Tank Locomotive that you wish to exchange, you see from the list that its exchange value is 6/3. You then look at the Hornby Train catalogue and choose one of the new Locomotives, the cost of which is not less than 12/6 (or, in other words, not less than double the Part Exchange allowance we make for your No. 1 Tank Locomotive).

You decide, say, to have a No. 2 Special Tank, the price of which is 25/-. Pack up your old No. 1 Tank and deduct 6/3 from 25/- (the price of the new No. 2 Special Tank) enclose a remittance for 18/9 plus 1/- carriage on the new Locomotive—19/9 in all. Send the Locomotive and the remittance to Meccano Limited, Liverpool.

Alternatively, you can take your old No. 1 Tank Locomotive to your dealer with a remittance for 18/9, and he will give you the new No. 2 Special Tank Locomotive that you require.

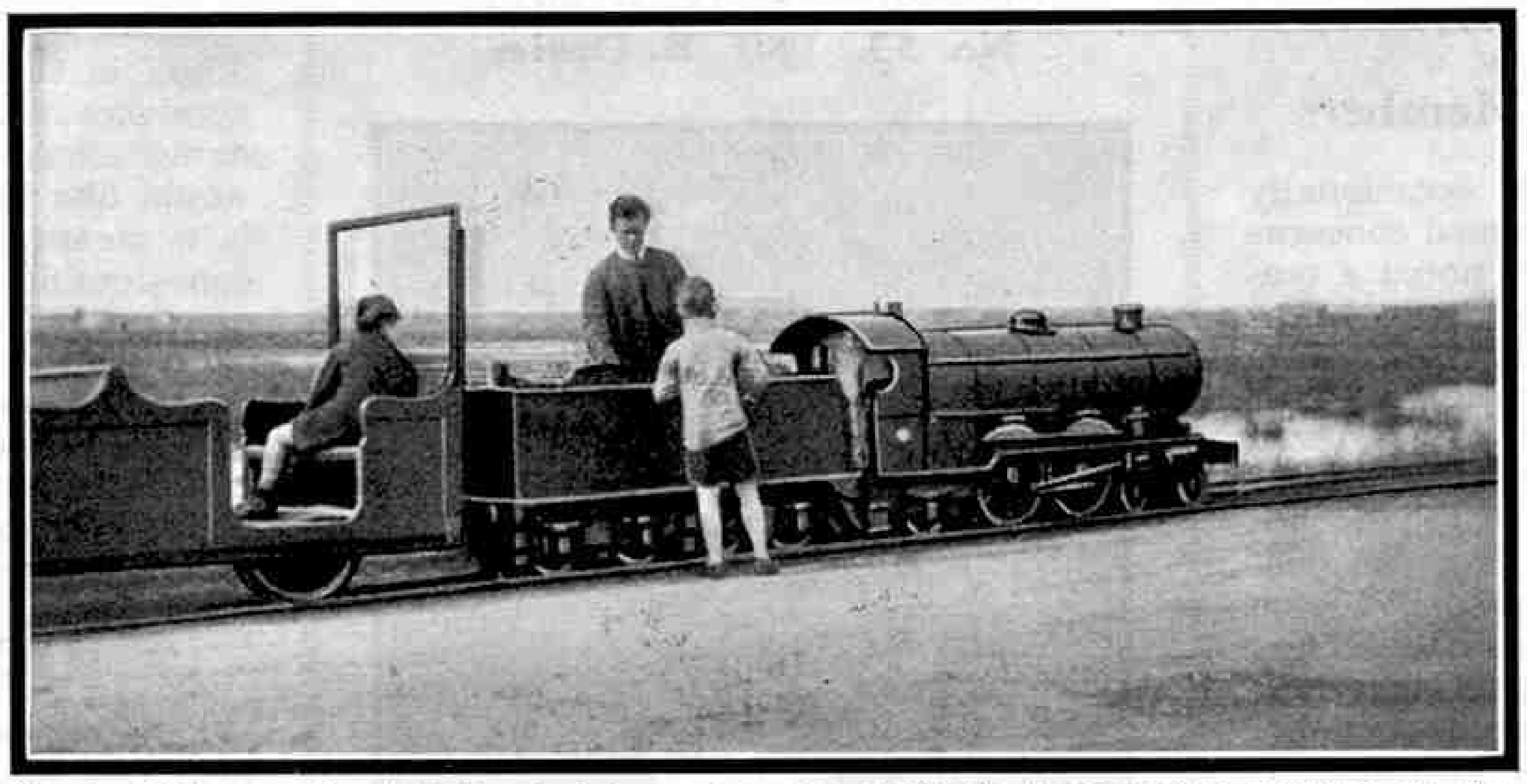
Hornby No. 2 Special Locomotive

HORNBY TRAINS

Manufactured by

MECCANO LTD., OLD SWAN, LIVERPOOL

Suggested Hornby Train Improvements



Hornby Railway enthusiasts keenly interested in the "Atlantic" locomotive working on the 15-inch gauge Fairbourne Miniature Railway at Barmouth.

0–4–2 TENDER LOCOMOTIVE.—A model of this type of locomotive would no doubt be interesting and would prove useful for light passenger services. This wheel arrangement is now obsolete, however, and is therefore unfamiliar to most Hornby railway owners. *(Reply to M. Bradley, Kilmarnock).*

DOUBLE ROAD STATION.—A double road station is easy to make up from two No. 2 Stations placed opposite each other. These may be extended by making use of the sections of Hornby passenger platform. The main characteristics of almost any station with which you are familiar may be represented in this manner. An article dealing with station platforms on Hornby railways appeared in the H.R.C. pages of the "*M.M.*" for April last, and we suggest that you should follow the hints there given. *(Reply to G. Addison, Wragley).*

COACH LIGHTING.—Small bulbs coated with luminous paint fitted in the Hornby Pullman Coaches would look interesting in the dark, but how many Hornby enthusiasts actually operate their railways in the dark? *(Reply to H. O. Marlow, Penmaenmawr).*

ENTRANCE HALL TO "WINDSOR" STATION.—The fitting to our "Windsor" Station of an entrance hall of the pattern you suggest would certainly be an attractive addition. Such an entrance would take up valuable space, however, and as space is a very important consideration on the majority of layouts we are afraid that we cannot adopt your suggestion. *(Reply to E. Thwaites, Chelsea).*

FOG SIGNALLING APPARATUS.—Miniature detonators and fog signalling mechanism are of no practical use on miniature railways, and have little interest except as a casual experiment. We have had practically no demand for such equipment. *(Reply to N. Persley, Hitchin).*

SEPARATE OUTER LINES OF DOUBLE TRACK.—This is an interesting suggestion, as such separate lines would allow of single track being easily converted into double track. We shall therefore consider the idea. *(Reply to R. Parry, Wrexham).*

POINTS LEVERS INSIDE THE CURVE.—Points with levers on the inside of the curve may be obtained to special order at the same price as points of the ordinary type. *(Reply to H. Silver, Shrewsbury).*

TRAIN PHOTOGRAPHS.—You cannot do better than write to Railway Photographs, 23, Hanover Street, Liverpool, for their list of railway photographs. The photographs published by this firm are all of splendid quality, and they cover a very wide range. *(Reply to H. Watson, Halifax).*

"SWITCH" NOTICE BOARD.—We suggest that you use for this purpose a "Catch Points" notice board, which is already available in the Hornby Railway Accessories No. 8. *(Reply to R. Shorncliffe, Exeter).*

CARRIAGE CLEANING APPARATUS.—A miniature carriage cleaning apparatus would not serve any useful purpose on a model railway, as it could not be used for actual cleaning operations. The best method of cleaning Hornby coaches is with a damp cloth, which will remove all traces of dirt. Running gear is best cleaned with a rag moistened with petrol. *(Reply to J. Hall, Peterborough).*

LARGER RANGE OF TUNNEL ENDS.—The Tunnel Ends already available in the Hornby Series represent as far as possible the type most commonly seen. If you specially require a more elaborate pattern, however, we suggest that you make it from cardboard, following the hints recently given in the H.R.C. "Junior Section" article. *(Reply to I. F. Banks, Bristol).*

DETAIL IN INTERIOR OF SIGNAL CABINS.—The addition of a shelf, together with miniature block instruments, would no doubt tend to improve the appearance of the Hornby Signal Cabin. We will therefore experiment in this direction. *(Reply to N. Dean, Penzance).*

BUFFERS ON "M" SERIES ROLLING STOCK.—Several suggestions for buffers have been received, and we agree that their introduction would be an improvement. The addition would necessarily add to the price, however. *(Reply to P. S. Robinson, Skegness, Lincs., and others).*

MODEL L.N.E.R. "MIKADO" LOCOMOTIVE.—A model locomotive of this type would have an attractive appearance, but as eight-coupled mechanisms are not available in the Hornby Series, we are afraid that we cannot introduce it. Also the L.N.E.R. is the only British railway to adopt this wheel type for tender locomotives. *(Reply to G. Watkinson, New England).*

C.L.C. COACHES.—We note your suggestion for the introduction of coaches lettered to represent the Cheshire Lines Railway. This railway is not familiar to the majority of railway enthusiasts, however, and we do not think that such lettering would be popular. *(Reply to R. Bainbridge, Farnworth).*

ETHYL PETROL TANK WAGONS.—We do not propose to add any further petrol wagons to the Hornby Series at present. Other additions to the tank series may be made later. *(Reply to D. Finlay, Carlisle).*

SMOKE DEFLECTORS.—Although some "Royal Scots" are fitted with smoke deflectors, we cannot see our way to fit them to our models. The engines concerned are certainly not improved in appearance by the addition of this fitting, and appearance is an important point in a model. *(Reply to M. G. Matheson, Birmingham).*

H.R. ROLLING STOCK.—The suggestion that our rolling stock should be lettered with the initials of the Hornby Railway Company has been made before, but we do not think the idea is practicable. *(Reply to G. Higgins, Cardiff).*

PRIVATE OWNERS' WAGONS.—From time to time we have received suggestions for the introduction of private owners' wagons, but we do not consider that these would be a useful addition to the Hornby System. All railway enthusiasts are interested in wagons lettered in accordance with the practice of the four groups, but it would be almost impossible to find private owners' lettering that would be generally popular. *(Reply to J. Partridge and E. Clark, Wellingborough).*

"MOUNTAIN" TYPE LOCOMOTIVE.—As there are no locomotives of this type in use on British railways, we do not think they would prove popular. We are concentrating on the production of British locomotive types that are in regular service. *(Reply to B. Jackson, Huntingdon).*

MIXED TRAIN SETS.—Low-priced mixed train sets would not be satisfactory, as it would be impossible to include sufficient vehicles of each type to produce an interesting train. We have always found it advisable to keep passenger and goods sets entirely separate. *(Reply to F. Howard, Darnall).*

RENAMING No. 3 G.W.R. LOCOMOTIVE.—Your suggestion that the No. 3 G.W.R. locomotive should be named after one of the famous "De Glehn" Compounds is interesting, but these locomotives are all scrapped. Our experience shows that obsolete types are not popular. *(Reply to C. Webster, Cheltenham).*

SEPARATE LOCOMOTIVE MECHANISMS.—The mechanisms fitted to Hornby locomotives may be obtained separately if desired. Let us know your requirements, so that we can advise you as to the best plan to follow. *(Reply to S. H. MacIntosh, Tetbury).*

STATION ADVERTISEMENTS.—Station advertisements may be introduced before long. We agree that they add a remarkable touch of realism to any layout. *(Reply to T. Thorne, Nuneaton).*

IRISH LOCOMOTIVES AND ROLLING STOCK.—Up to the present we have had few enquiries for locomotives and rolling stock lettered to represent Irish railways. If a demand arises, however, we shall consider their introduction. *(Reply to P. Keen, Queenstown).*

CURVED DIAMOND CROSSING.—This type of crossing would no doubt prove useful for making up track layouts such as you illustrate. We are at present considering the question of introducing a double track junction, and any further developments will be announced in these pages. *(Reply to W. Thompson, Sheffield).*

"CALLING ON" ARMS ON SIGNAL GANTRY.—"Calling on" arms would no doubt look realistic on a Hornby Signal Gantry, but extra levers would have to be accommodated on the Gantry posts, and the general effect would be clumsy. *(Reply to W. Aspinall, Glossop).*

TOOL VAN.—Tool vans are not very frequently seen in actual railway practice, and therefore are hardly likely to be popular with Hornby railway owners. We suggest that you should make use of the No. 1 Luggage Van, or the No. 1 Guard's Van, to represent such a vehicle. *(Reply to E. Hamilton, Godalming).*

SCALE REVERSE LEVER.—A reverse lever projecting through the floor of the cab might look more realistic than the present fitting, but it would be difficult to make a lever neat in appearance and at the same time sufficiently strong. Another objection is that the cab floor would be weakened. *(Reply to H. Phillipson, Montreal).*

HALF LENGTHS OF PASSENGER PLATFORM.—We doubt if there would be a great demand for half lengths of passenger platforms. The present pattern is of sufficient length to accommodate one bogie coach and this is therefore a most convenient dimension. *(Reply to N. Cutler, Cambridge).*

NEW PATTERN OF GAS CYLINDER WAGON.—A new pattern of gas cylinder wagon with one large cylinder would no doubt be very effective. The present type, however, is very popular, and we do not think it would be worth our while to effect a change. *(Reply to C. Stainer, Retford).*

Looking Ahead

August is the great holiday month of the year. I hope that members of the Guild who visit the country or the seaside during this month will have a thoroughly enjoyable time, and that the sea breezes and the winds sweeping over the moors and mountains will give them renewed vigour. I have no doubt that a large part of their increased energy will be expended for the benefit of the clubs and am looking forward to a great increase in interest and enthusiasm as soon as the holiday season comes to an end.

The beginning of a new session is at hand, and now is the time to think over matters of policy for the coming winter. As a rule, the commencement of the Autumn Session is a period of active recruiting and preparations should be made to give the newcomers a welcome that will make them feel at home immediately.

Meccano Club Leaders

No. 53. Mr. B. Davies

Mr. B. Davies is Leader of the Bell Hill and District (Pitsea) M.C., which was affiliated in February of this year. Members are keen to make it successful and an attractive programme has been arranged in which Model-building Competitions and Hornby Train Evenings figure prominently.

Encouraging Junior Members

A special difficulty that occasionally arises when active work is resumed concerns the ages of members. I have noted a tendency in some clubs to exclude boys below a certain age on the ground that this would hamper members of long standing, some of whom are apt to feel a little aggrieved when asked to associate with boys several years younger than themselves. I do not think this is altogether wise, for the continued success of a club largely depends on the training of young members to occupy positions of responsibility when their turn comes. Every encouragement therefore should be given to youthful recruits. If they are sufficiently numerous a special section should be formed for their benefit, thus overcoming the principal objections that a few older members may have.

I have been interested to find that in one club the true relation between the senior and junior members has been recognised by naming the two sections " Engineers " and "Apprentices" respectively, and it is the ambition of every apprentice to qualify for membership of the " Engineers " section. In some clubs senior members act as leaders of junior sections, and in others they do their share of the good work by giving short talks to the younger members, chiefly on Model-building. As a rule, these talks take the form of demonstrations of the use of Meccano parts in the construction of models of different types. They are greatly appreciated by the juniors, who rapidly become expert model-builders and, what is perhaps more important from the point of view of the club, respond quickly to the general feeling of friendliness that prevails. When encouraged in this manner, they become useful members, and on becoming seniors, they are always ready to give friendly assistance of the same kind to newcomers.

In many clubs no definite junior section has been formed, but in these the younger members naturally take their places in the groups into which the clubs have been divided for competition purposes. This step also ensures good training, for senior members willingly give assistance to their juniors, both being inspired by the desire to see the sections to which they belong excel.

Join the Correspondence Club

There is an increasing demand among members of the Correspondence Club for pen friends in Canada and the United States. I hope that members of the Guild living in those countries who have not already joined the club will seriously consider doing so immediately, for interesting correspondents in Great Britain, Australia, India and other countries are waiting for them.

Other places where correspondents are wanted include the Federated Malay States, Kenya, Shanghai and the East Indies. Several members in England wish to exchange letters with members of the Guild living in the countries named, and there are also a number of Guild members in Holland who wish to be put into touch with friends in the same places desirous of corresponding in the Dutch language.

I should like to remind members that in filling in their entry forms for the Correspondence Club, they should take care to name alternative countries in which they would like to have pen friends. This step is a means of preventing delay and is a considerable help to the staff at Headquarters. Inability to put new members in touch with friends in the countries they specially favour is usually due to a temporary shortage of correspondents in those parts of the world, but their principal requirements are kept on record in order that I may be able to satisfy them at the first opportunity.

Coming Events

Two interesting Exhibitions are being held this month by Meccano Clubs. The first is that of the Northern (Dundee) M.C., which will be held in the club room at 260, Hill Town, Dundee, from 3rd August to 8th August. This is the first Annual Exhibition of the club and on each day the club room will be open from 7 p.m. to 10 p.m. The charge for admission is 4d. for adults and 2d. for boys, and tickets may be obtained from the secretary, W. Brown, 6, Stirling St., Dundee.

The second of the two exhibitions has been arranged by the Sid Vale M.C. and will be held in the Market Hall, Sidmouth, on 4th, 5th, and 6th August. On each day the exhibits will be on view from 10 a.m. to 6 p.m. and a hearty invitation is extended to all Meccano boys and readers of the *"M.M."* in the neighbourhood.

* * *

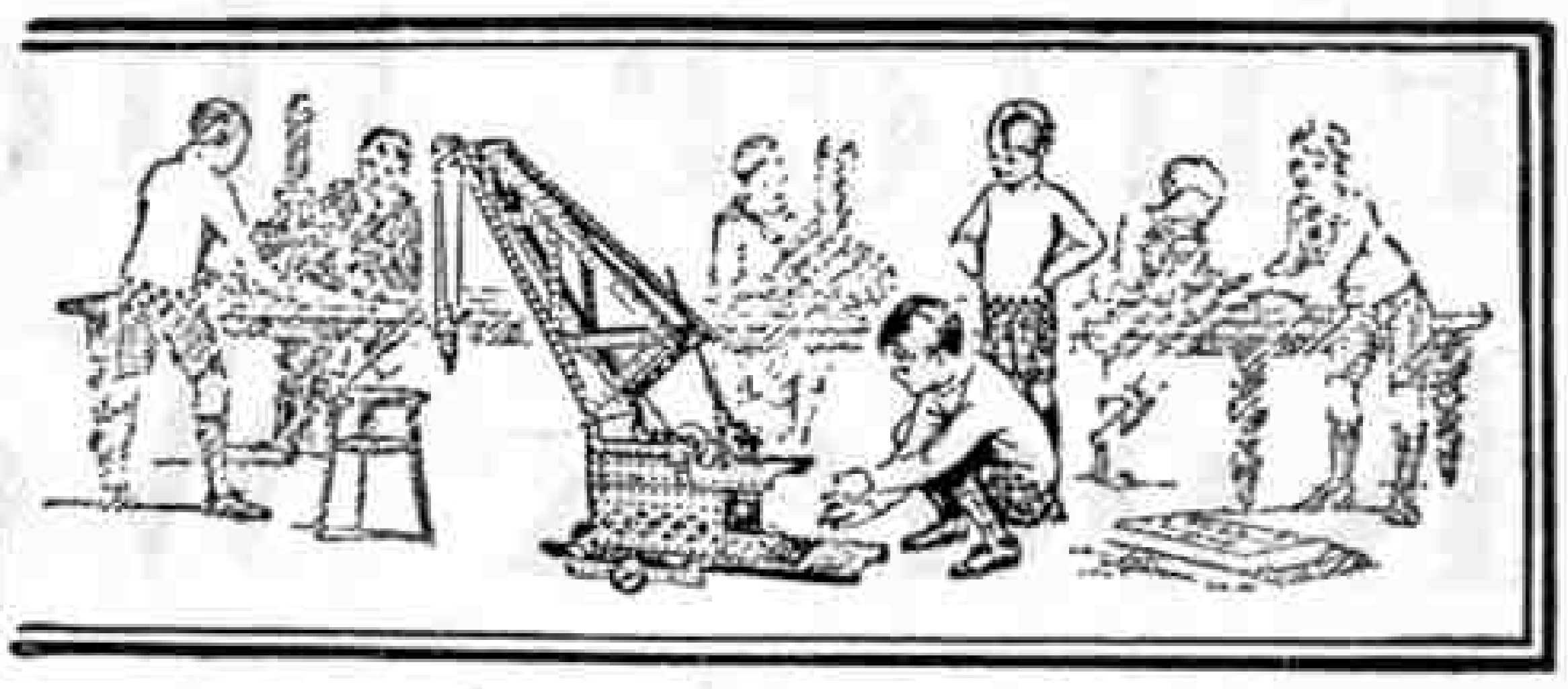
I regret to announce that the Newcastle-on-Tyne M.C. was disbanded on 1st June, 1931. No person therefore has authority to collect subscriptions or goods on its behalf. When a new club is formed full details will be given in the *"M.M."*

Proposed Clubs

Attempts are being made to form Meccano Clubs in the following places and boys interested should communicate with the promoters whose names and addresses are given below:—

MACCLESFIELD—J. Woodhouse, Central School, Macclesfield, Ches.
TAYPORT—R. Stobie, Old Manse, Tayport, Fife.

CLUB NOTES



Alton M.C.—Interest in Hornby Trains has increased so greatly that at least one night per month is now to be devoted to operations on the club track, which is to be extended as funds permit. A lantern is now available and interesting lectures are being arranged. A new activity is Fretwork. Members have made many useful articles and a contribution is to be sent to the local Arts and Crafts Exhibition. A very interesting debate was held on "*The Value of Speed Records to Industry.*" Club roll: 18. *Secretary:* H. F. Pitt, 53, Queen's Road, Alton.

St. Peter's (Wolverhampton) M.C.—The Rev. J. Du. B. Lance, B.A., is now Leader of the club, which has made excellent progress since becoming affiliated. A specially interesting feature of the programme has been a debate on the suggestion that in fifty years' time air travel will have displaced travelling on land. After a furious discussion the suggestion was approved by a large majority, one member remaining neutral! Club roll: 20. *Secretary:* F. Mann, 25, Queen St., Wolverhampton.

Greenford M.C.—The Exhibition was very successful and members were greatly encouraged by the excellent results of their efforts. Interesting Model-building schemes are followed. At one meeting members made experiments with types of levers. At others electrical work has been carried out and trials were made of a Traction Engine built by the secretary. At present Cricket is the most prominent feature, and a series of matches is being played. Club roll: 15. *Secretary:* C. Howe, 145, Costons Lane, Greenford.

Northern (Dundee) M.C.—With regular practice and guidance from the Leader, skill in Model-building is increasing, six members having recently been awarded prizes at a special Display. The club has a splendid Hornby Train Layout that is in regular use. New members will be cordially welcomed and should write to the secretary for full details. Club roll: 31. *Secretary:* W. Brown, 6, Stirling St., Dundee.

Blackburn No. 1 M.C.—The proceeds of the recent Exhibition amounted to £3/18/6, and the improvement in the club's financial condition has enabled a new club room to be secured. This was officially declared open by Mr. W. Donald, President of the club, and the event celebrated by a Social Evening at which 60 people were present. Rambles and Cricket constitute the summer programme, and the Seniors have organised a Camp at Rhyl. Club roll: 40. *Secretary:* F. Hulme, 23, Primrose Bank, Blackburn.

Attenborough Choir M.C.—Mr. H. F. Wicks, Leader, has been obliged to resign, and Mr. C. Dennis and Mr. H. Barsley are now joint Leaders. In this club members construct models at home and these are judged at meetings by the Leaders, when good points and ingenious constructions are demonstrated for the benefit of all. Successful Debates have been held and the club Magazine is making good progress. At a special meeting the programme was arranged by members themselves. Club roll: 23. *Secretary:* G. W. Render, 34, Church Street, Beeston, Notts.

Sid Vale (Sidmouth) M.C.—Excellent fun was obtained on a recent Contractors' Night when tenders were asked for a bridge to carry the track of the club's Hornby Railway over a river 2 ft. in width. The Bridge constructed by the winners was a reproduction of the Forth Bridge. Model-building competitions have included one for models showing how electricity may be used in conjunction with Meccano. A special Comic Night was held, when humorous Meccano models were shown. A Lecture was given on the use of the Meccano Motor and this was demonstrated by a Meccano Motor Chassis on loan from Headquarters. A large number of books have been given in order to establish a Library. Cricket matches and rambles are being arranged for the summer, and a visit is to be paid to the Observatory. Club roll: 30. *Secretary:* R. Passmore, Ivedon Cottage, Newtown, Sidmouth.

Plymouth M.C.—Recent activities have included Debates, Talks, and Hornby Railway Evenings. A visit is to be paid to the Plymouth and Dartmoor Railway. An excellent programme will be followed when indoor meetings are resumed. Club roll: 10. *Secretary:* G. J. Symons, 6, Holland Road, Plymouth.

A happy group of members of the Herne Bay M.C. Our photograph was taken at a picnic organised by the club, the programme of which is a happy blend of Model-building and other hobbies with healthy outdoor recreation.

Solihull School M.C.—Models recently constructed have included a Flying Boat and the Motor Chassis, and one member has constructed a model to show that a wire expands when heated. One interesting evening was spent in designing and constructing models of Suspension Bridges. During last session a Hockey Team was formed and this had an excellent season. Debates have been held and a particularly interesting lecture on "*Trinidad*" was given by a member. Club roll: 15. *Secretary:* B. T. Gray, Solihull School, Solihull, Nr. Birmingham.

Preston Embee M.C.—The Annual Exhibition was very successful. The models displayed were excellent and there was keen competition for the two medals awarded for the best exhibits in the Senior and Junior sections respectively. A visit to the Meccano Factory, Liverpool, was greatly enjoyed, and this was followed by a trip down the Mersey to New Brighton. An Aeroplane Section has been started, Mr. L. J. Tait having kindly taken the leadership of this venture. Constructional meetings in the club room are followed by outdoor trials of the models built. Club roll: 31. *Leader and Secretary*: Mr. J. Drysdale, 20, Meath Road, Broadgate, Preston.

Hackney M.C.—The Model-building abilities of members have been greatly improved as the result of talks on how to use Meccano parts. These are given by Senior members during the last ten minutes of each meeting. The club now possesses a large Meccano Outfit, and this is employed in building super models. Good use is made of Lantern Lectures, which are given by the Leader. Club roll: 20. *Secretary:* A. T. Field, 76, Lavender Grove, Dalston, E.8.

Ramsey M.C.—An outstanding feature has been a particularly enjoyable Contractors' Night, when two "firms" built large bridges. Plans were drawn up and carefully scrutinized before erection was begun, and the parts were hoisted into position by means of cranes in the same manner as in large scale operations. On one bridge four cranes were engaged in the work of assembly at the same time. Club roll: 13. *Secretary:* C. Butcher, Princess St., Ramsey.

AUSTRALIA

Castlemaine M.C.—Is now making excellent progress. Model-building Contests and Hornby Trains events are the chief features of the programme. In a recent "Simplicity" Contest models of the Sydney Harbour Bridge and a Reaping machine were entered. These were remarkably realistic although simple in design. Lectures have been given by members on subjects of interest chosen by themselves, and a "Pound" night was a great attraction. Club roll: 14. *Secretary:* G. Otzen, 201, Barker St., Castlemaine, Victoria.

CHINA

Swatow M.C.—Meetings continue to be well attended. Members are keen on Model-building, Fretwork and Stamp Collecting, the chief activities of the club, and entries in Model-building and other contests are always of a high standard. Club roll: 10. *Leader and Secretary:* Mr. S. T. Lim, P.O. Box 34, Swatow.

GREECE

Athens College M.C.—Visits figure prominently among the attractions, two of special interest having been paid to the Athens Works of the Columbia Gramophone Company and the Totoi Aerodrome. The club room is open to members for Model-building and reading on three days in each week. Great care is taken to keep students at the School who are not members informed of the work of the club, reports being posted regularly on the Bulletin Board and included in the School Magazine, an excellent production printed partly in English and partly in Greek. Club roll: 18. *Secretary:* A. Apostolou, Metelenis 25, Athens, Greece.

NEW ZEALAND

Sumner (Christchurch) M.C.—This newly affiliated club is making excellent headway. Meetings are held fortnightly, a room being lent by the President, Mr. Wm. C. Collins, who has also placed a splendid Hornby Train at the disposal of members. Mr. Collins gave a talk on "*Money,*" and other interesting subjects dealt with by members have included the gyro-compass and a visit paid to Wigram Aerodrome, near Christchurch, by one of the members who made a flight in a "Moth." Club roll: 13. *Secretary:* T. Booth, 41, Head St., Sumner.

Clubs Not Yet Affiliated

Central (Forfar) M.C.—An excellent club room has been secured and members are very keen. A Leader is required in order to secure affiliation and the Secretary would be pleased to hear from any gentleman who is willing to act in this capacity. The summer programme includes Cycle Runs, but indoor meetings also are being held for Model-building, Fretwork, and discussions on Stamp Collecting. *Secretary:* J. Barrett, 8, Little Causeway, Forfar, Scotland.

Streatham M.C.—Regular meetings are held in the Church Hall, Streatham, from 7 p.m. to 9 p.m. on Wednesdays, but members assemble at other times both in the club room for Model-building and out of doors for sports and cricket. The interesting programme also includes Amateur Dramatics, Physical Training Evenings and various games. Preparations are being made for an Exhibition to be held in the Autumn Session as an aid to recruiting. *Leader and Secretary:* Mr. G. C. Haygreen, 40, Credenhill St., Streatham, S.W.16.

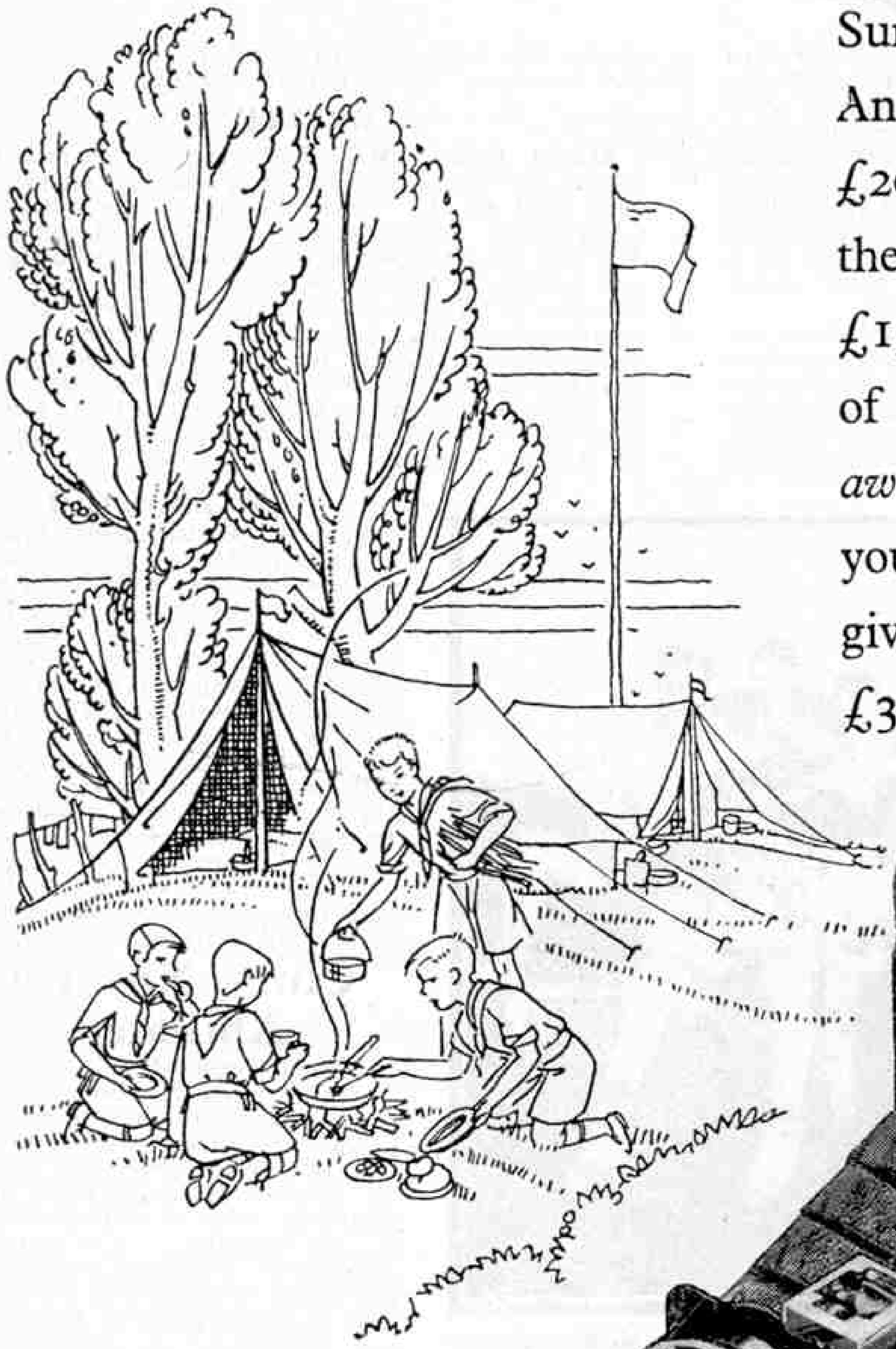
Sanquhar M.C.—The club roll is steadily increasing and enjoyable meetings are being held. Members have been greatly interested in constructing a large club model of a Double-Deck Omnibus. A Drawing Contest has been held for the purpose of deciding who should be appointed Draughtsman and Designer to the club. On Games Nights miniature Billiards and Table Tennis are the chief attractions. *Secretary:* J. Rigg, "Crawick Lea," Sanquhar.

Bradwell M.C.—A business meeting has now been held at which officers were elected and a good programme drawn up. This includes Model-building and Hornby Train operations, a Model-building scheme having been devised that will add to the attractions of the club's miniature railway. The printing works of Messrs. McCorquodale & Co. Ltd. have been visited. *Secretary:* R. Bellchambers, 39, King Edward St., New Bradwell.

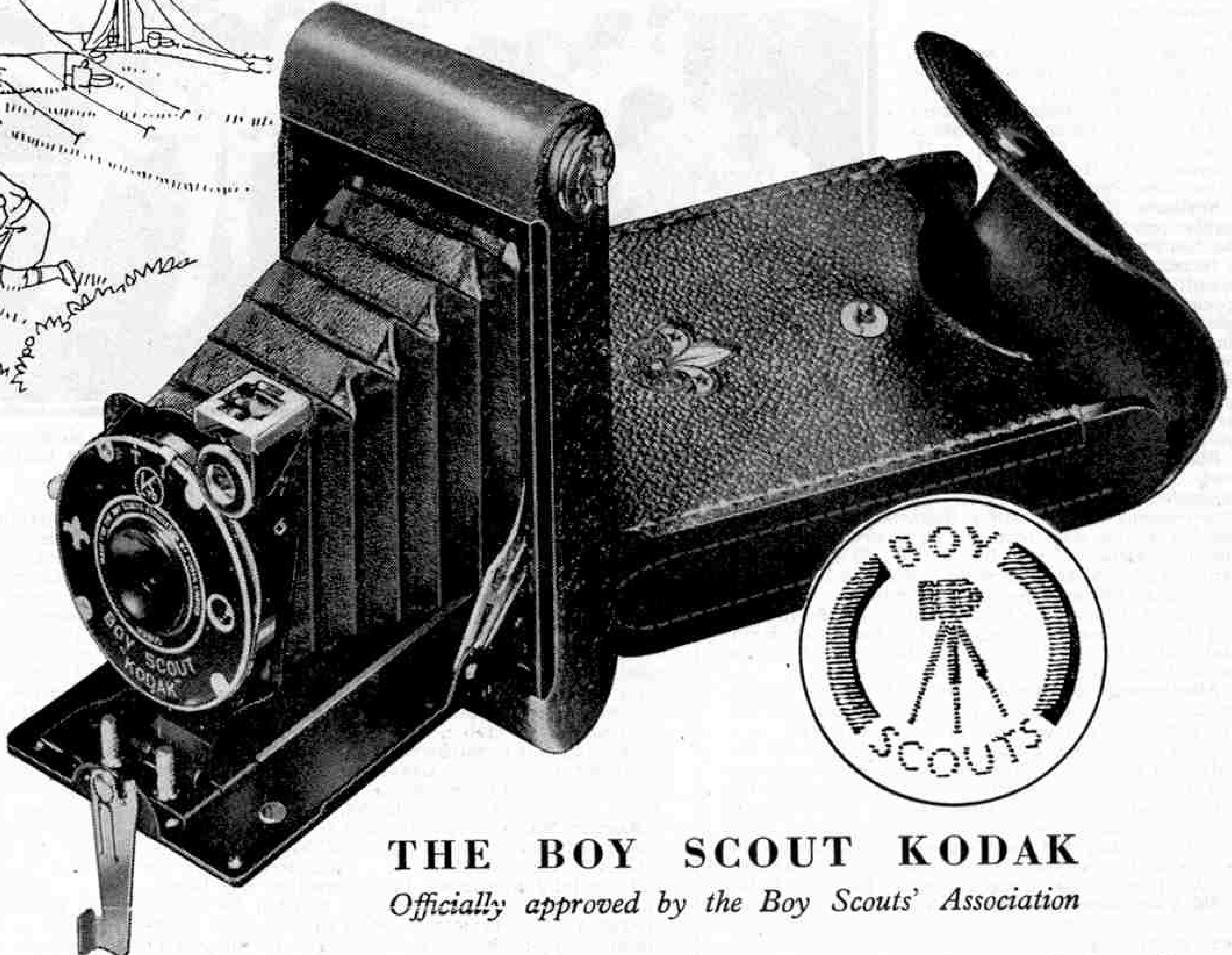
NEW ZEALAND

Wellington M.C.—An exhibit is being prepared for display at the Winter Show to be held shortly in Wellington. A number of models are being constructed for this purpose, the chief of which is a large club model of the Sydney Harbour Bridge. Hornby Railway Nights are held regularly and are a great attraction. A Recruiting Campaign is being carried on, and the local dealer has kindly allowed circulars giving details of the club's activities to be placed in the copies of the "*M.M.*" that he sells, in addition to exhibiting notices. *Secretary:* J. E. Barnsley, Newport Terrace, Seatoun Heights, Wellington.

Enter those snaps for the Kodak World Competition!



Summer is giving you the chances to take interesting snaps. And it's interesting snaps that will win in the Kodak £20,000 World Competition. In this great competition there are 379 prizes for the British Isles alone. A prize of £1,000, six prizes of £100, six of £50, six of £10, thirty prizes of £5 and three hundred and thirty prizes of £1. *All to be awarded for picture interest.* Only amateurs may enter and you can send in snaps of any subject. Any Kodak dealer will give you entry forms and tell you how one snap can win £3,300! The competition closes on August 31st. Enter to win!



COMPLETE
WITH CASE
27/6

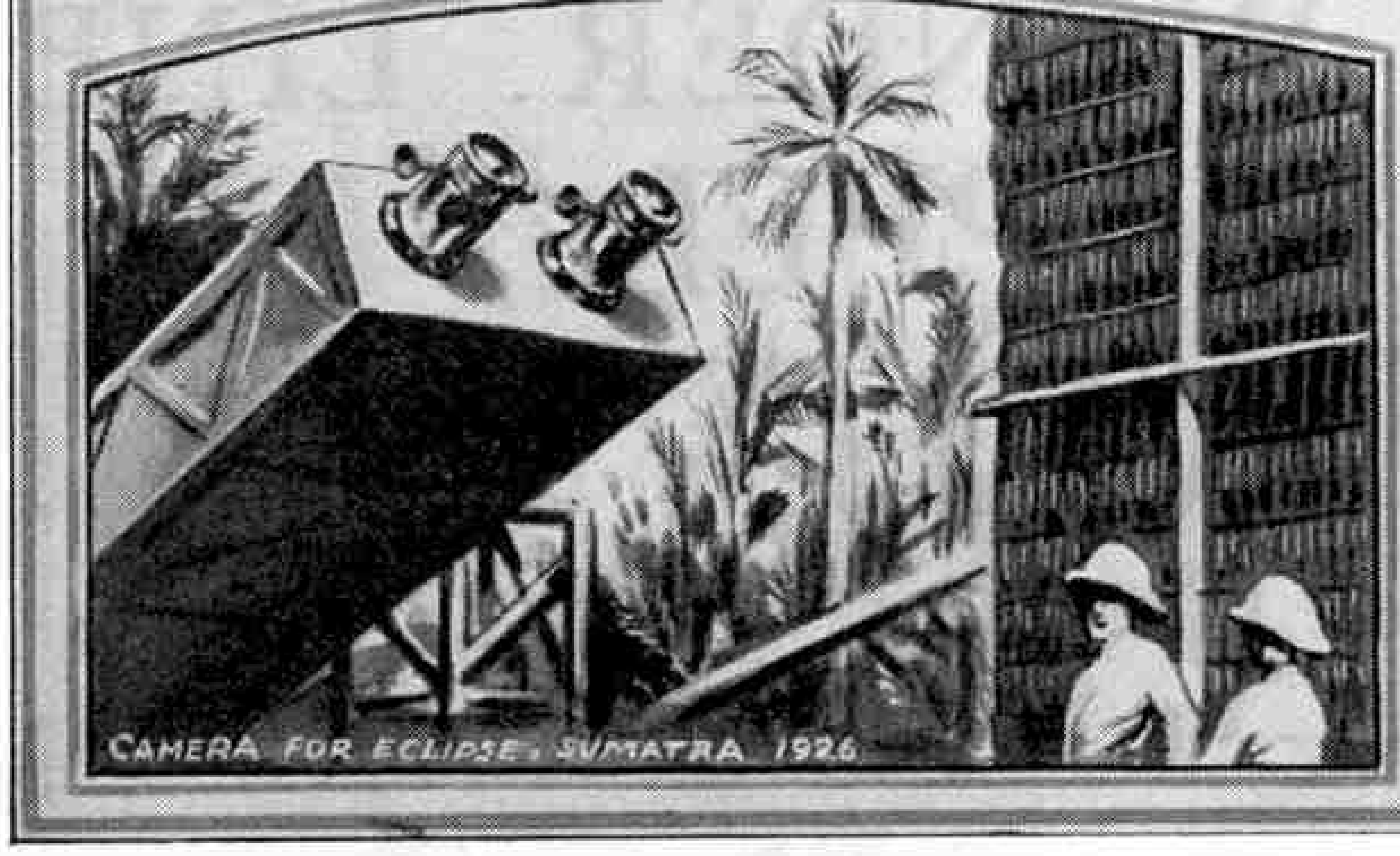
THE BOY SCOUT KODAK

Officially approved by the Boy Scouts' Association

TO QUALIFY FOR YOUR PHOTOGRAPHER'S BADGE—you must develop and print your own photographs. Use "Kodatone" Printing Paper. Hypo is all you need and this is a daylight paper. You can see how your print is coming out. No guesswork! "Kodatone" Self-Toning Paper by Kodak.

A new camera made specially for the Boy Scout. It has four stops—will take landscapes, interiors, portraits with either instantaneous or time exposures. In a special dark green leather case that slips on the belt—ready to be used at a moment's notice! "Be prepared"—with a Boy Scout Kodak.

IF IT'S PHOTOGRAPHY – IT'S KODAK



PHOTOGRAPHY

AT THE SEASIDE

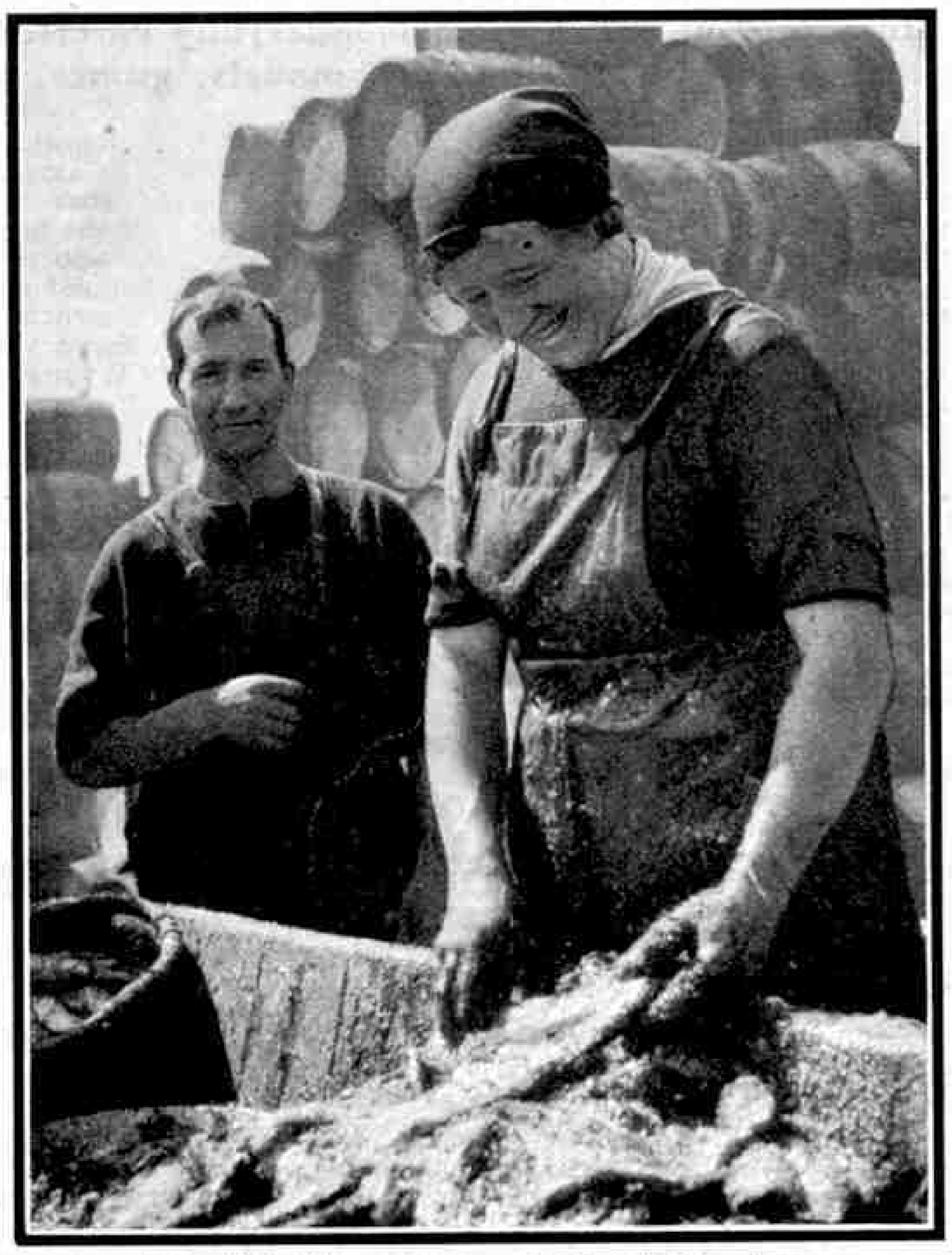
THE majority of readers spend some part of their summer holiday at the seaside, and therefore a few hints on seaside photography will be of interest.

The most noticeable difference between photography at the seaside and in inland towns lies in the strength of the light. The intense brilliance in the light at the seaside, which is often very trying to the eyes until one becomes used to it, is due to the clearness of the air and the large amount of light reflected from sea and sky. On this account seaside photography is comparatively easy as regards the exposure problem, and even those with the cheapest types of camera are able to secure good results without difficulty. Indeed, in the late morning and early afternoon hours, when the sun is blazing down from a cloudless sky, it becomes really difficult to under-expose on such subjects as open beach scenes or ships in the open.

An interesting group of spaniel puppies. For this photograph and the one below we are indebted to the courtesy of Kodak Limited.

The sea offers boundless opportunities to a keen photographer, but it is remarkable how seldom it is really well depicted. Attempts to photograph a wide expanse of open sea always result in disappointment. The same holds good with photographs of stretches of open country, and the reason is that the camera cannot deal adequately with big distances. The eye automatically adapts itself to observing objects at different distances, but the camera lens is unable to do this. Distant objects, therefore, appear in a photograph so dwarfed as to be quite without interest. Special lenses are made to overcome this difficulty to a great extent, but few readers are likely to use them. The most effective seascapes are those that have some object such as a boat or rocks in the foreground.

In photographing breaking waves the secret of success is to hold the camera low down, the lower the better. Waves photographed from a high viewpoint become flattened and appear insignificant in size, whereas they may be made to appear larger than they actually are by utilising the lowest possible position for a camera. In photographing breaking waves the camera should not be pointed straight out to sea, but should take the waves at an angle. Many of the most striking seaside photographs are those of a combination of sea and rocks, and if a really rough sea occurs during one's holidays the chance of making striking pictures should be seized immediately.



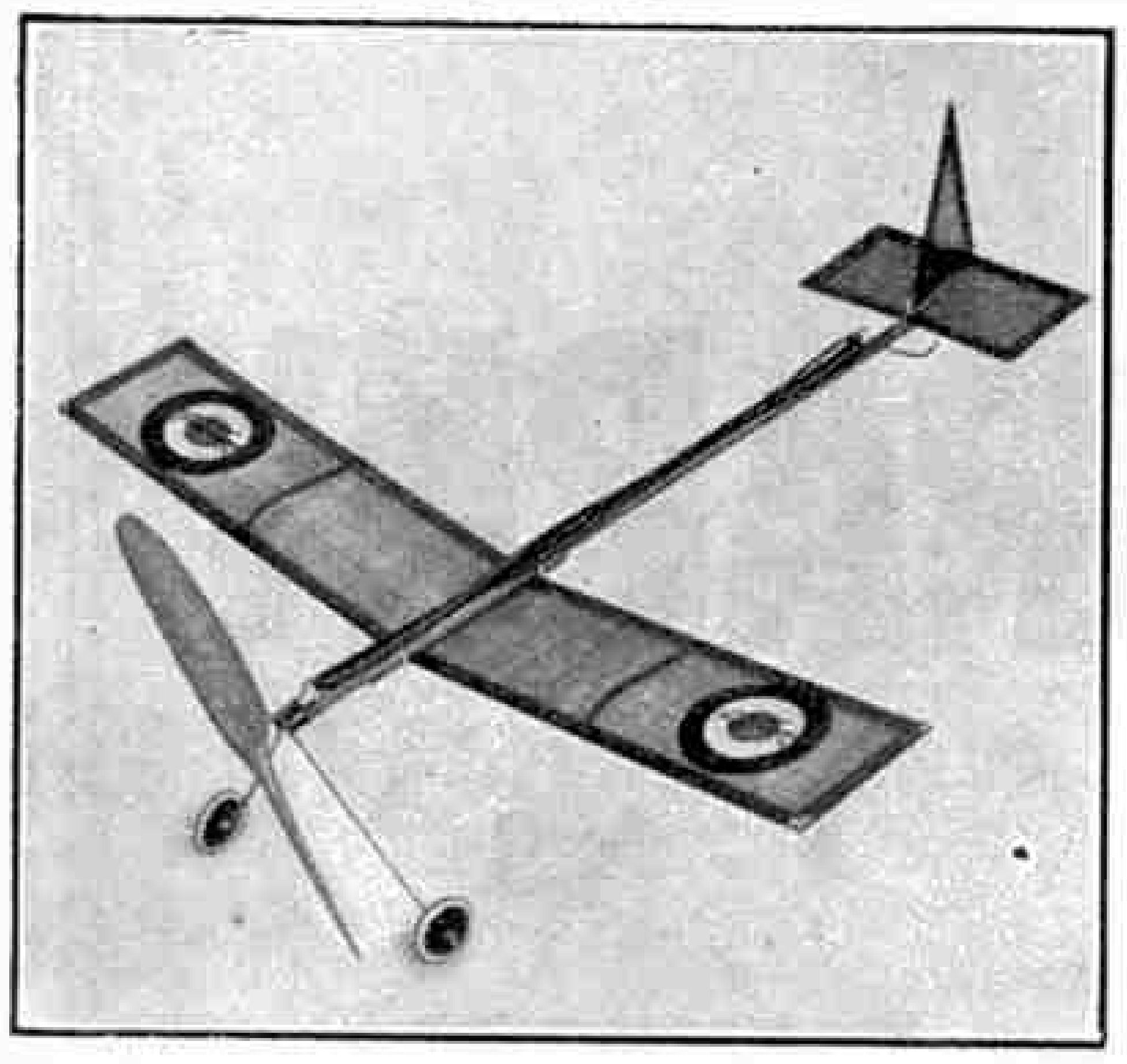
A Scottish fisher girl at work cleaning herrings.

The range of photographic objects at the seaside is practically unlimited. If the coast round about is wild and rocky, with high cliffs towering upward from the water's edge, there will be ample scope for many striking pictures. If the coast is low and sandy its beauties are not so obvious, but such a coastline affords compensations in regard to animated beach scenes with their great variety of amusements, and the constant coming and going of small boats taking passengers for a sail or for fishing.

Yachts or sailing boats are excellent subjects for the camera and as a rule are not difficult to take. Sometimes they may be photographed from a pier, but a better result is obtained by snapping them from the shore or from a small boat. A broadside view of a sailing boat, or one directly bow or stern on, is usually unsatisfactory, and a three-quarters view gives the best result. The position of the boat on the print is of importance in regard to producing the effect of movement. If the boat is travelling slowly, it looks best just entering the picture, as if it were moving slowly across. If it is sailing fast, however, it should be past the centre of the print. Sailing boats at anchor make very effective pictures, and the arrivals and departures of pleasure steamers provide interesting and often amusing material for photographs.

Many thousands of snapshots are taken every summer along the crowded beaches of our popular resorts, but a large proportion of these pictures are not successful because the photographer has made the mistake of including too much in the view. A snapshot of a big expanse of sand crowded with people is almost always unsatisfactory, because it has no centre of interest. The best pictures are those that have a small group of people in the near foreground, so that they appear in the print of sufficient size to stand out well from the general beach background. Among the most attractive beach subjects may be mentioned bathing scenes, children playing on the sands, the inevitable donkeys, and model yacht sailing. If opportunity occurs, a few snapshots of the beach should be taken from a small boat close in shore.

In taking seaside photographs it is a good plan to keep in mind the preparation of an album to form a holiday record. One of the most interesting holiday albums we ever saw consisted almost entirely of series of photographs illustrating certain episodes. One series dealt with a lifeboat practice, and showed the opening of the lifeboat house, the hauling out of the boat on to the slip, and its subsequent launch in a whirl of spray. The series ended with the return of the boat and its hauling up the slip into the boat house. We recommend our readers to try this series idea, for we are certain that they will find the results extremely interesting.



HERE'S A WONDER LINE The "NIPPER" WARNEFORD of course!

Performance Counts—Not Size!

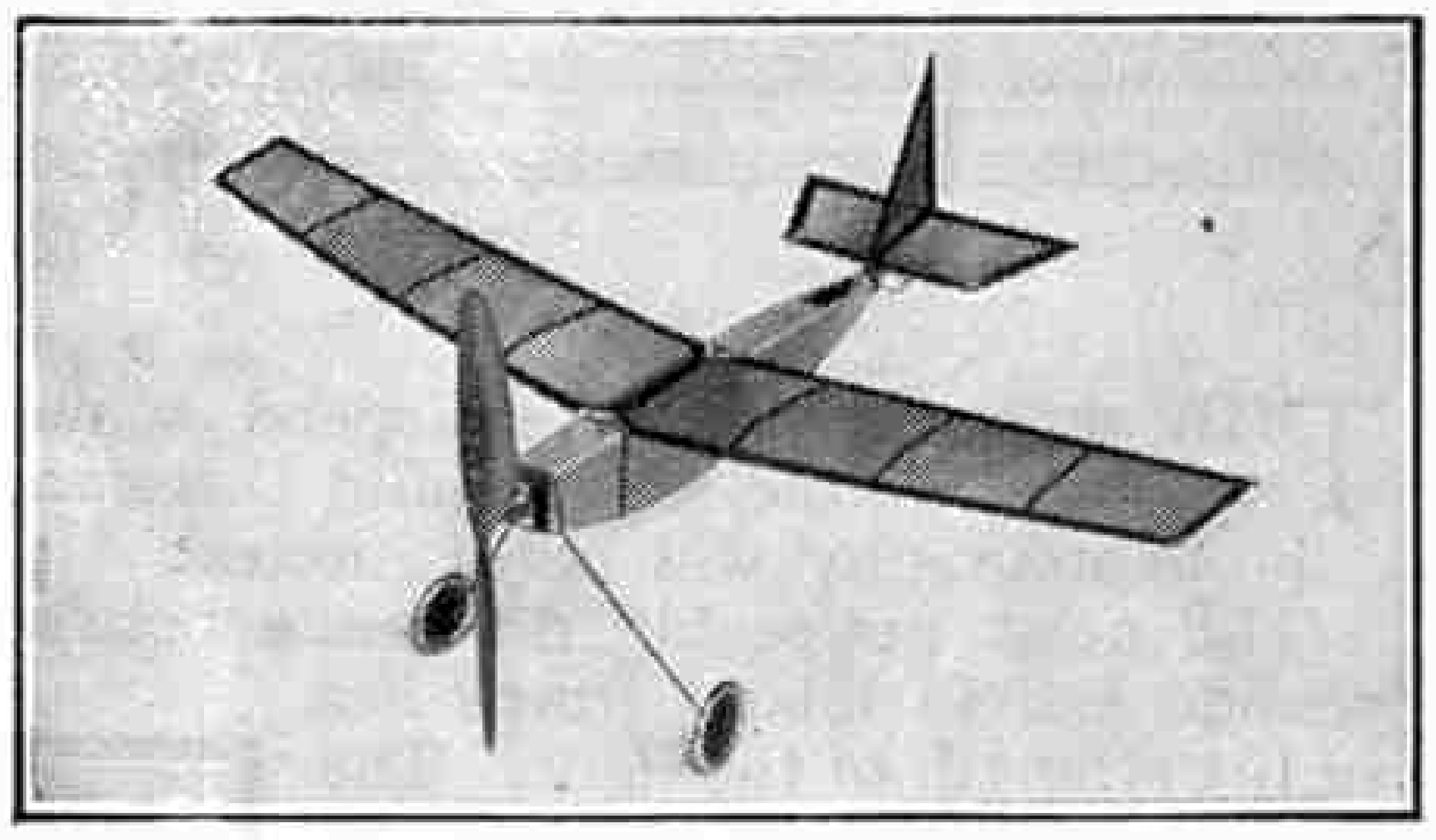
The "NIPPER"

Price 2/6

Special Features:

A long bearing allowing no movement or wobble on the propeller—therefore a steady flyer. High tension steel wire tail and rudder—therefore model can be adjusted for stunting. All aluminium wheels, fitted brass bearings, and the model has an amazing performance as the whole Aeroplane weighs less than one ounce. The finest machine ever produced at such a price.

FREE! All Warneford Models are capable of a duration of 30 secs. Any pilot who obtains this performance with a duly witnessed flight is entitled to the certificate and Blue and Gold Wings of the WARNEFORD JUNIOR AIR LEAGUE. An entry form and full particulars are enclosed with every Machine retailing from 4/6 upwards. New descriptive booklet post free on application.



The "WHIPPET" Fuselage Model Price 17/6

Fitted 11 in. hand-carved and balanced propeller, and covered orange proofed silk. This beautiful Fuselage Model Aeroplane has an excellent performance, is very strong, and has full adjustment of main-plane tail and fin. It dismantles and folds so that it fits into a very small box for storage and transport, the finish is in keeping with the usual Warneford high standard, and at its price it is undoubtedly the finest value ever offered. Weight, 4⅜ ounces. Distance, 550 feet. Speed, 17 m.p.h. Ceiling, 50 feet. Rises from the ground.

OTHER WARNEFORD MODELS FROM 1/6 TO 35/-

Warneford Aeroplanes are obtainable from all good Stores, Toy Shops and Sports Dealers throughout the country.

Sole Manufacturer:

F. J. MEE (Dept. C), 137a, GREENWICH ROAD, LONDON, S.E. 10

A Great Holiday Attraction for Boys—

GAMAGES—HOLBORN

BOYS! Now that the holidays are here be sure and arrange a visit to Gamages, "The Boys' Own Store." You will have a wonderfully entertaining and exciting time inspecting the finest display of toys, models, games, etc., in Europe.

Free on request: Gamages Giant 140-page Toys, Models and Games Catalogue.

You'll have fine fun with a

CROSSBOW SET

With four rubber tipped arrows for long distance shooting, quite harmless, and good sport guaranteed. Price **5/-** Post 6d.

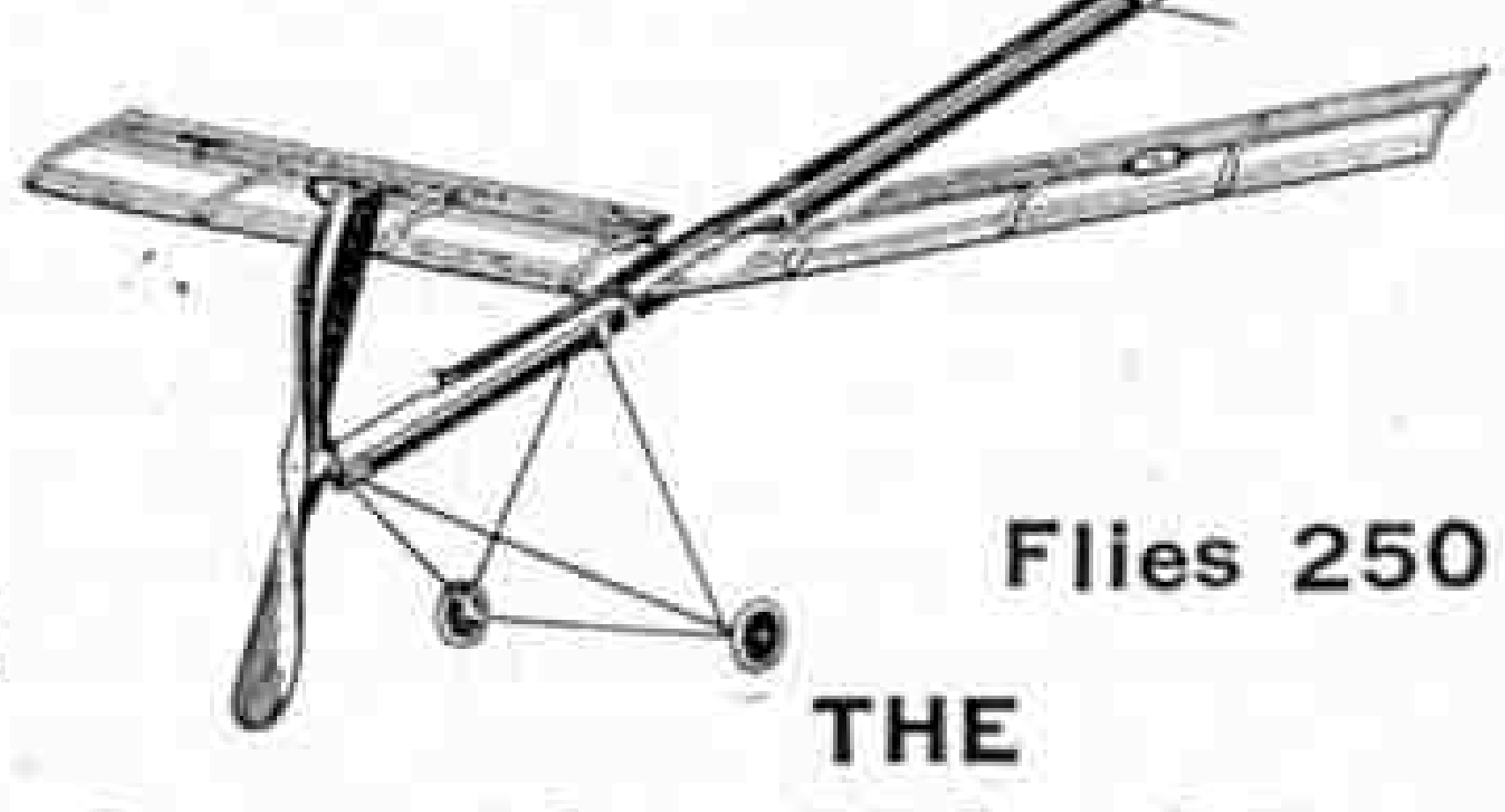
FOUR RATER YACHTS

Remember. Gamages show you the finest selection, finest construction, finest value. If you desire a special design, Gamages will build to your own specifications.

PRICES:

15" **20/-.**
18" **27/6.**
21" **35/-.**
24" **52/6.**

Greyhound Class 24" **32/6.** 30" **52/6.** 36" **79/6.** Skimmers 14" **13/9.** 16" **15/-.** 18" **17/6.** 20" **25/-.** Carriage extra on all Yachts.

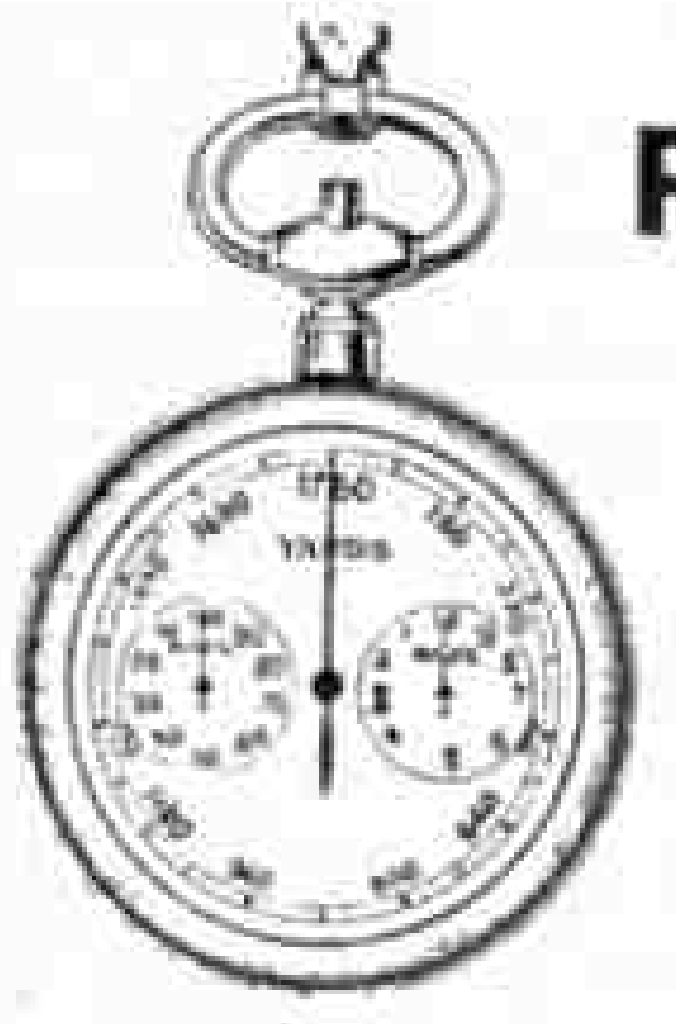


Flies 250 yds.

THE CLASSIC MONOPLANE

No. 1. A strong realistic "rising off the ground" model. It will fly approximately 250 yards. It has a wing span of 30". Price **10/6** Post 6d.

No. 2. Flies 350 yards. Wing span 33". Price **15/6.** Post 9d.



PEDOMETERS

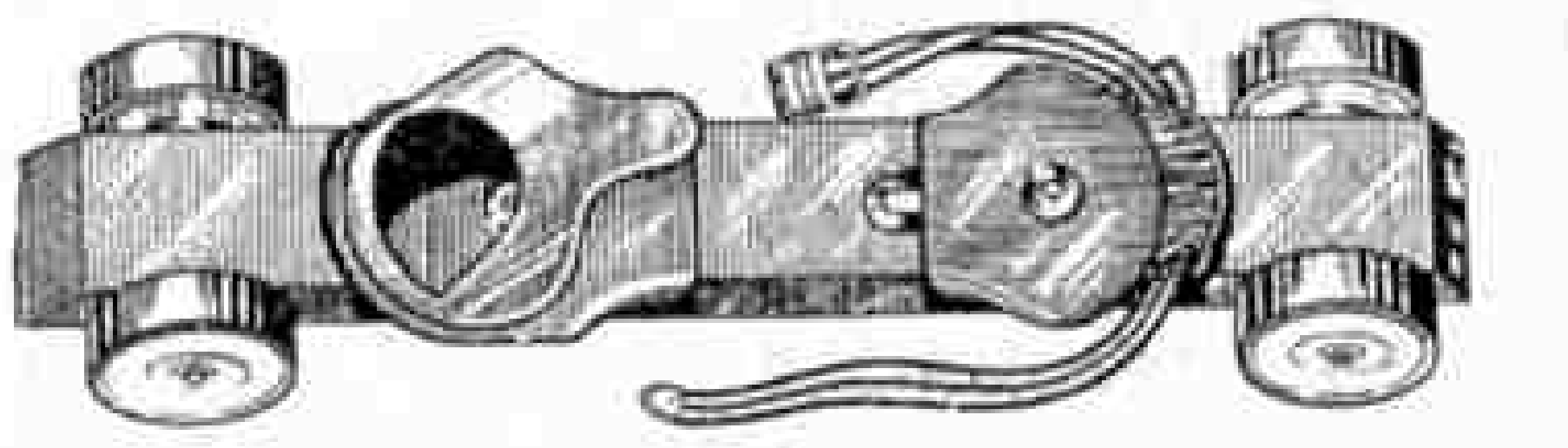
for the Hiker

Fasten to coat and record accurately distance walked. Adjustable to any stride. Our models were used in recent newspaper test. Model 1 recording up to 12 miles. Post 2d. **9/6**

Model 2 recording up to 100 miles **12/6.** Post 2d.

"Speedicraft" Clockwork Boat

The "Speedicraft," immensely popular with model power boat enthusiasts. Carved from yellow pine, enamelled in various colours, have mahogany decks with cockpit and hatch, fitted with powerful clockwork motors. "Swift." 15" long **6/6** "Swallow." 16½" long **8/6** Post 9d. on each boat.



It takes you twice as far

THE SCOOTER SKATE

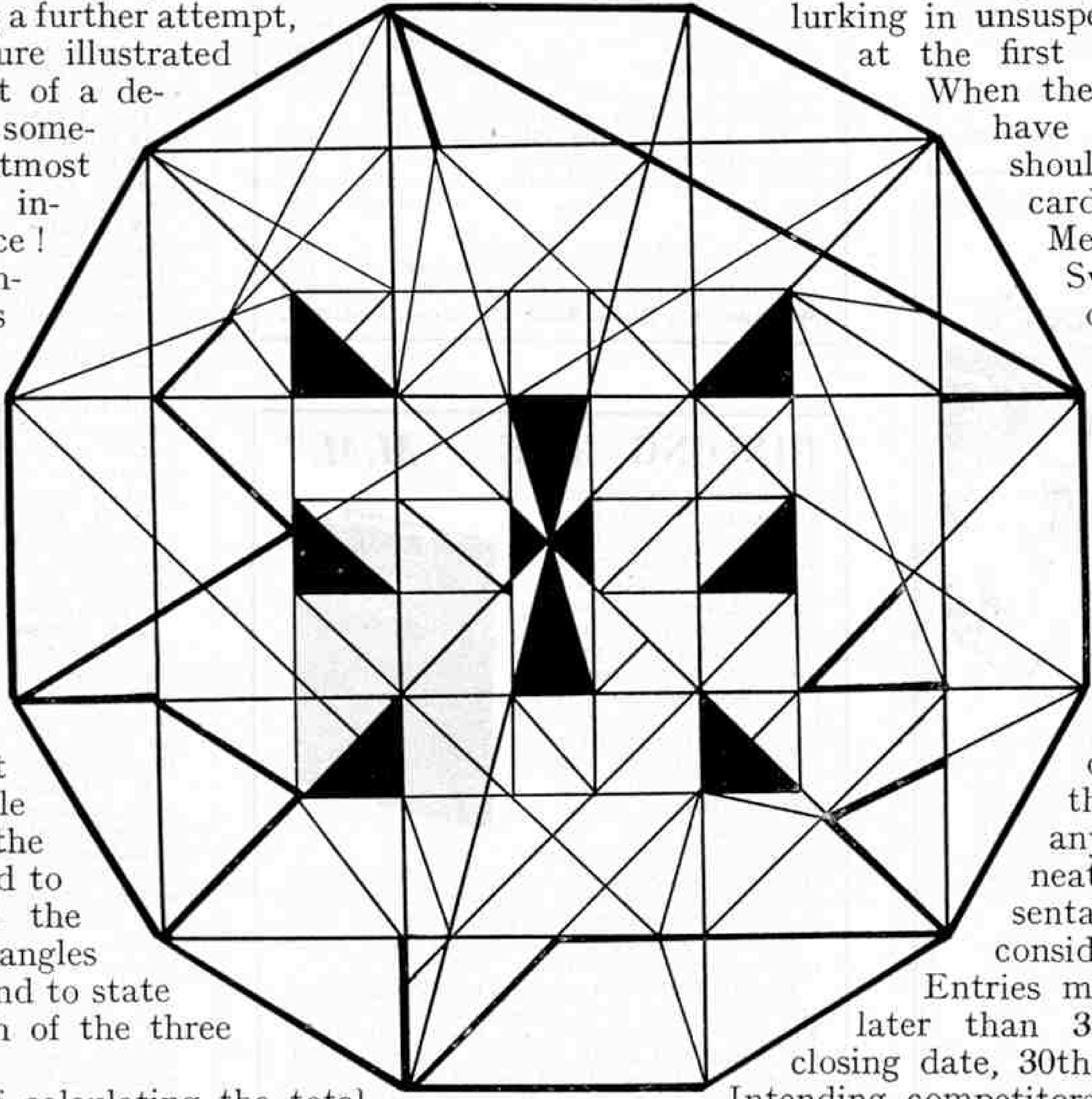
Because of its exceptional length, each scoot on this skate takes you twice as far as you can travel on an ordinary skate. The Scooter Skate is 14½" long and the foot portion extends from 6" to 10½". Made of solid steel with red webbed belt and self fastening buckle. Price only **2/6** Post 6d.

GAMAGES, HOLBORN, LONDON, E.C. 1 *City Branch: 107, Cheapside, E.C. 2.*

Competition Page

A NEW SHARP EYES PUZZLE

WE have often tried on this page to outwit the keen eyes of our readers, but have always been compelled to admit that many readers have risen superior to every effort to puzzle them. This month we are making a further attempt, and the twelve-sided figure illustrated on this page is the result of a determination to produce something that will tax to the utmost our readers' skill and ingenuity—and their patience! Knowing their thoroughness in competitions of this kind, we feel sure that they will show equal determination in their efforts to solve the problem we are setting this month.



Reference to the figure shows that it is intersected by a bewildering number of lines running in many directions. These have cut it into a number of simple geometrical figures, and the task our readers are asked to accomplish is to count the triangles, squares and rectangles that have been formed, and to state the total number of each of the three kinds of figures.

There is no method of calculating the total number of figures in the diagram, for the intersecting lines forming them have been put in at random. Every part of the drawing will have to be examined carefully, therefore, and the number of separate figures determined by actually counting them. This cannot be done in a hurry. Many pitfalls will be encountered and competitors probably will find that there are an amazing number of triangles, squares and rectangles lurking in unsuspected places not revealed at the first count.

When the numbers of each figure have been ascertained they should be written on a post card and sent to "Triangles, Meccano Magazine, Old Swan, Liverpool." Prizes of Meccano products (to be chosen by the winners from our current catalogues) to the value of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the four solutions nearest to the correct totals in order of merit, and in addition there will be a number of consolation prizes. In the event of a tie for any or all of the prizes, neatness and novelty of presentation will be taken into consideration.

Entries must reach this office not later than 31st August. Overseas closing date, 30th November.

Intending competitors are reminded to place their names and full addresses on their entries. Hardly a month passes without some excellent entries having to be passed over through the competitors' failure to give their names and addresses.

August Photo Contest

Our monthly Photographic Competitions this season are again being run to provide intending competitors with the widest possible scope, the prizes being offered for the best photographs submitted, irrespective of their subjects. The restrictions are very simple: the exposure must be the work of the competitor and a title must appear on the back of each print submitted.

This month's competition will be divided into two sections, A for competitors aged 16 and over, B for those under 16. Prizes of Meccano or Hornby Train products or photographic materials, as the winners select, to the value of 21/– and 10/6 respectively, will be awarded in each section.

Entries must be addressed "August Photographic Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool." Closing date, 31st August: Overseas, 30th November.

Competition Closing Dates

HOME

Triangle Puzzle	**31st August.**
August Photographic Contest	**31st August.**
Electric Motor Essay	**30th September.**

OVERSEAS

Missing Word Contest ...	**31st August.**
May Photographic Contest ...	**31st August.**
June Crossword Puzzle ...	**30th September.**
June Photographic Contest ...	**30th September.**
Electric Motor Essay	**30th September.**
Cricket Voting Contest ...	**31st October.**
July Photographic Contest ...	**31st October.**
Triangle Puzzle	**30th November.**
August Photographic Contest	**30th November.**

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to state their ages clearly.

Entries, other than prize-winning efforts, for photographic, drawing and similar competitions, can be returned only if a stamped addressed wrapper is sent with the entry.

COMPETITION RESULTS

HOME

Missing Words.—1. C. D. ROBINSON (Manchester); 2. J. C. PHILLIPS (Nth. Thoresby); 3. K. M. GILLILAND (Belfast); 4. A. J. TREHERNE (Rotherham). Consolation Prizes: H. R. DEACON (Cheltenham); A. FROST (Bournemouth); J. L. LEE (Bolsover); C. SHAW (Stoke-on-Trent); V. SWINDELL (Nottingham); G. W. WILLIAMS (Cheam).

June Photographic Contest.—After careful consideration the judges found it impossible to differentiate between three of the entries in the A section of this competition, and accordingly the first and second prizes have been added together and divided equally among the three competitors as joint winners. The awards were as follows:—Section A: Joint First Prize: W. H. FOSTER (Bingley); J. B. GIBSON (Durham); J. F. HUSON (Upper Norwood, S.E.1). Section B: First Prize: A. W. MARSTON (Forest Hill, S.E.23); Second Prize: MISS P. CHALLIS (Bexhill-on-Sea). Consolation Prizes: J. P. L. ANDREW (Hey, Nr. Oldham); G. C. CHURCH (Watford); MISS P. HAWKS (Shortlands); L. F. WEIR (Portsmouth).

OVERSEAS

Engineering Jokes.—1. F. WHYTE (Ipswich, Queensland); 2. R. E. BERNSTEIN (Johannesburg); 3. R. BIRTWISTLE (West Midland, W. Australia); 4. A. JOHNSTONE (via Casino, N.S.W.). Consolation Prize: B. D. H. J. SILVA (Colombo, Ceylon).

COMPLETE YOUR FILES

All "Meccano Magazines" prior to December 1923 with the exception of November and December 1917, February and March 1918, and May and June 1919 are out of stock. Each of the 1924 issues with the exception of January, February, March, June and September is in stock. Only the October and November 1925 issues are available. All the 1926 to 1931 issues are in stock with the exception of January, February, April 1926, March and July, 1927, January, February, April, August 1928, February and May 1929 and January 1930.

Copies of back issues will be sent, post free, price 3d. for issues prior to 1925, 4d. for the issues of 1925 and 1926, with the exception of the December numbers. The December issues of 1925 and 1926, and all the issues from 1927 to date are 8d. each.

Quotations for complete bound volumes may be obtained from the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

The Meccano Engineer's Pocket Book

Essential to the equipment of every Meccano Boy

The Meccano Engineer's Pocket Book, which has been specially designed for the use of Meccano boys, is strongly bound in imitation red leather, the paper being squared exactly as that used by real engineers. It enables you to make drawings of any engineering structures—Cranes, Bridges, Steam Shovels or Locomotives—that you may see on your travels.

If you are a Meccano boy you should adopt the habit of taking engineering notes and sketches of interest, as this will help you to get a great deal more fun out of your hobby. For instance, supposing you are on a tour of inspection of some interesting docks and a cleverly designed crane catches your eye. "Just the very thing for me to build with my Meccano" you say to yourself, and you immediately proceed to make a sketch of the important features, with a view to constructing a Meccano model of the crane when you get home.

The Meccano Engineer's Pocket Book costs 1/- post free (Overseas price 1/6 post free), and will be sent on receipt of this amount in stamps. Write to Department No. 73, Meccano Ltd., Old Swan, Liverpool.

Meccano Limited
Old Swan - Liverpool

D.C. ELECTRIC TRAINS FROM A.C. MAINS

Avoid tiresome accumulators. You can operate your D.C. electric models from the house supply (alternating current 50 cycles only) by means of our Mains Rectifier. Standard unit gives 6 volts 2 amps. D.C. and costs 42/6 post free. Larger sizes on application. State voltage when ordering.

TAIT

49, The Avenue, Sunbury, Middlesex.

MECCANO MANUALS

The Meccano Manuals are all beautifully printed and the illustrations are in half-tone throughout. Every Meccano boy should possess a copy of each of the 00-3 and 4-7 Manuals, in which a total number of 889 models is illustrated, and also a copy of the Standard Mechanisms Manual, in which a fine selection of real engineering movements that may be built with Meccano are reproduced. These Manuals may be purchased as separate units, or attractively bound in full cloth cover, lettered in gold.

The prices of the full range of Meccano Manuals are as follows:—

No. 0 Manual of Instructions	Price	6d.
No. 00-3 ,, ,, ...	,,	1/6
No. 4-7 ,, ,, ...	,,	1/6
Standard Mechanisms Manual	,,	1/-
"How to use Meccano Parts" Manual	,,	6d.
Bound Manual of Instructions ...	,,	6/6

Meccano Ltd., Binns Road, Old Swan, Liverpool.

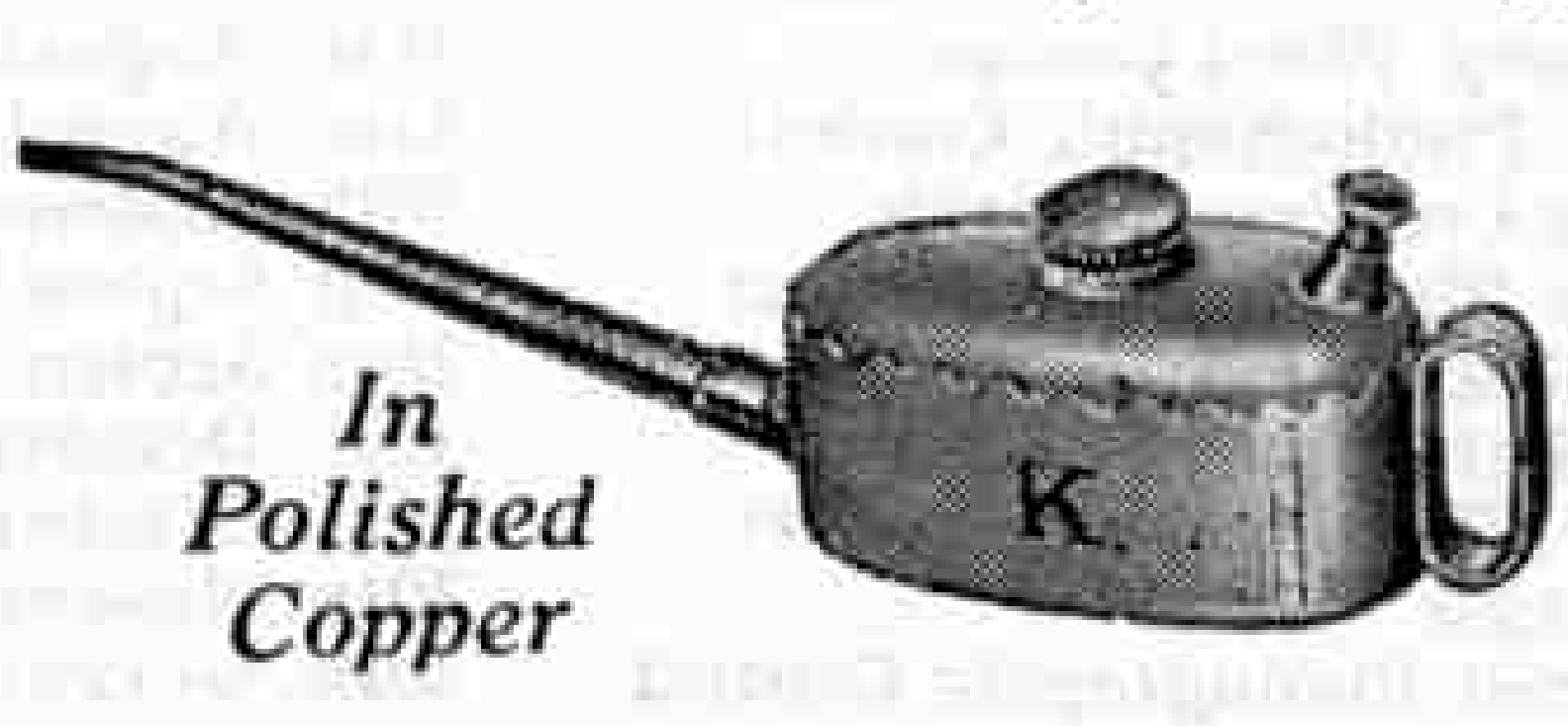
BINDING THE "*M.M.*"

Binding cases for back numbers of the Magazine may be obtained from Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These are supplied in two sizes (1) for six copies price 3/6 and (2) for twelve copies price 5/3, post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth"—that is to say three-quarters of the sides are dark crimson cloth and the back and a quarter of the sides are dark crimson leather as shown here. The case is tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding 6 and 12 copies. These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 6/6 for six issues or 8/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above. Back numbers for any volume can be bound and the case will be embossed with the volume number.

OIL CAN No. 2 ("K" Type)



In Polished Copper

Every Meccano and Hornby Train enthusiast should add a miniature "K" type oil can to his equipment for the purpose of oiling Meccano models, Hornby Trains, etc. The oil is ejected drop by drop by depressing the valve, as in the full-sized model, and in all other respects the oiler is perfect.

One of the oil cans was sent to H.R.H. the Prince of Wales, and a gracious letter of acknowledgment was received expressing H.R.H.'s admiration of the beautiful lines and perfect finish of this model. Price 3/6

Meccano Ltd., Binns Road, Old Swan, Liverpool.

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

R. Styles (Loscoe, Derby).—"You are not like most Editors." Is this flattery or insult, Ronald? Your brother and yourself are wise in reading the French "*M.M.*," for it offers an attractive means of getting to know more about another language.

T. C. Evans (Oswestry).—We shall probably introduce another series of "Outfit" Model-building Contests before long. In the meantime the "Simplicity" Contest announced this month provides a splendid opportunity for boys with small outfits.

W. Higgins (Belfast).—"Father growled about the floor being covered with rails, but when he saw my Hornby Trains running he was soon as excited as I was!" We are not surprised to hear this. Keep your father in that spirit, Willie, and he will buy you more trains!

G. Walters (Dunedin, N.Z.).—Many thanks for the interesting photographs of the earthquake. This must have been a terrible experience for everybody concerned. We grumble at our climate in this country, but we are really very fortunate in having no dreadful experiences of this kind. We are glad your uncle escaped injury.

D. W. Elliott (Leeds).—"Meccano has helped me tremendously in my engineering studies. It does not just build attractive models, but makes it easy to construct real mechanisms and study their principles." We were greatly interested in your cheery letter.

T. S. Hughes (Doncaster).—"Why not have a series of competitions in each of which some special river conditions are described, and prizes awarded for models of the best type of bridge to be used in the circumstances?" This is a very sound idea, and we shall give it careful consideration. Thanks for the suggestion, Tom.

R. O'Connor (Quebec).—We cannot agree that we have neglected Canadian railways in favour of those of the United States. We have had many articles on Canadian locomotives, and have other interesting ones in preparation. Your railway photographs will be welcome.

C. R. Hatchway (Birmingham).—"When the '*Exploration of the Antarctic*' is finished, please give us articles on the exploration of other parts of the world." This is a good idea, and one that we shall hope to carry out. What part of the world do you suggest first?

J. E. Broadhurst (Westcross, Glam.).—"I was in an isolation hospital, and had just had a serious operation, when I was told that I had been awarded a prize for my idea for a new Meccano part, and it cheered me up ever so much." This is good to hear; we only wish we could have brought the news to you personally! We hope that by this time you are well again, and that your troubles are over.

Mr. H. Mills (Dunkirk, Ches.).—"As one who has seen Meccano and the "*M.M.*" develop to their present wonderful state, I must add my appreciation. I have had endless pleasure from both, and although now past boyhood I still build models and read the "*M.M.*" with zest; which proves your maxim that 'the right age for Meccano is between 7 and 75.'" Your letter was a pleasant surprise after so long a silence. It is cheering to receive still another tribute to the value of Meccano as a relaxation for "grown-ups."

G. Judd (London, E.7).—We are glad you like the first of our series of articles on "Lives of Famous British Admirals." This series is evidently going to be very popular. At present we cannot see our way to issue a coloured plate with each number of the "*M.M.*"

C. N. Marston (Halifax).—"I began my Meccano career at the age of five with a No. 1 Outfit and since then have added parts until it has developed into a large collection." Your recent success in a model-building competition shows that you have made good use of your collection. There is nothing like beginning early!

R. Garcia (Port of Spain, Trinidad).—Your account of the East Indian Festival in Trinidad is very interesting. We hope to commence before long a series of articles on "The Life Story of Meccano," but we cannot promise to reproduce photographs of Mr. Hornby, the Editor, and the Guild Secretary—"the Great Silent Ones of Meccanoland," as you call them!

W. H. Rawlins (Montreal West, Canada).—"Each month I pick up the "*M.M.*" to read the stamp columns, as I am a collector, and each month I end up by reading the whole magazine!" This is one of the cheeriest compliments we have received for a long time. We are always interested to receive cuttings in regard to interesting events in Canada.

Fireside Fun

AN ILLUMINATING EXPLANATION

Teacher: "James, why was the period between A.D. 500 and A.D. 1200 known as the Dark Ages?"

"Because those were the days of knights," replied James, suddenly waking up.

* * * *

Artist (exhibiting pictures): "Some American chap has offered me a hundred pounds for this thing of mine."

Friend: "Great Scot! I should have bid about ten bob."

Artist: "Would you? Well-er-look here, old man, you have it. I never was keen on works of art leaving the country."

* * * *

"Why does the manager seem so partial to young Smith?"

"Because he's the only one on the staff who isn't taking correspondence lessons with the idea of becoming manager himself!"

* * * *

Mrs. Brown: "Does your husband work, Mrs. Smith?"

Mrs. Smith: "Oh, yes, he sells toy balloons when there is a parade in town. What does your husband do?"

Mrs. Brown: "My husband sells smoked glasses when there is an eclipse of the sun."

* * * *

The unpopular master had ordered the class to write an essay on "Manners." Up sprang Smith.

"May I write on Bad Manners, sir?" he asked, amid titters.

"Certainly," replied the master, blandly. "Just write about what you know best."

* * * *

Big-Game Hunter: "Oh, yes, on several occasions I've been nearly eaten by lions. But then, life without a little risk would be a very tame affair, wouldn't it?"

Listener: "I agree, sir, I agree! I frequently take risks myself. Often when the weather has seemed doubtful I have deliberately gone out without my umbrella."

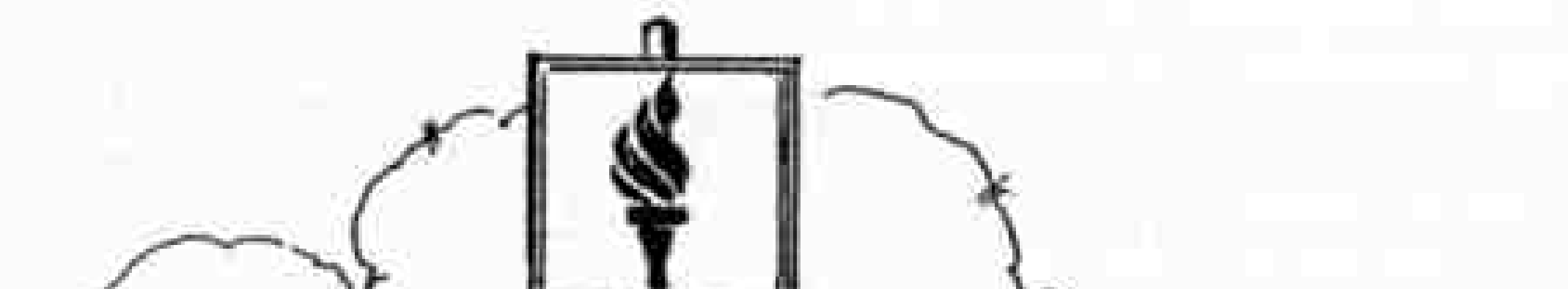
* * * *

"How kind of you," said the girl, "to bring me these lovely flowers. They are so beautiful and fresh. I believe there is some dew on them yet."

"Yes," stammered the young man in great embarrassment, "but I am going to pay it off to-morrow."

* * * *

OBEYING INSTRUCTIONS



Henry was late again for school.

"What is your excuse this time?" asked his teacher.

"A sign down the road, sir," said Henry.

"Explain yourself."

"Well, the sign said 'School; go slow,' so I did."

* * * *

Teacher: "This essay on 'Our Dog' is word for word the same as your brother's."

Small Boy: "Yes, sir, it's the same dog."

A SLIGHT MISTAKE

"I believe, sir, that we shall have another thunderstorm to-day," said the young clerk to the pompous chief.

"We? We? May I ask, young man, how long you have been part owner of the world?" haughtily enquired his employer.

* * * *

Guest: "Look here. How long do I have to wait for the half portion of duck I ordered?"

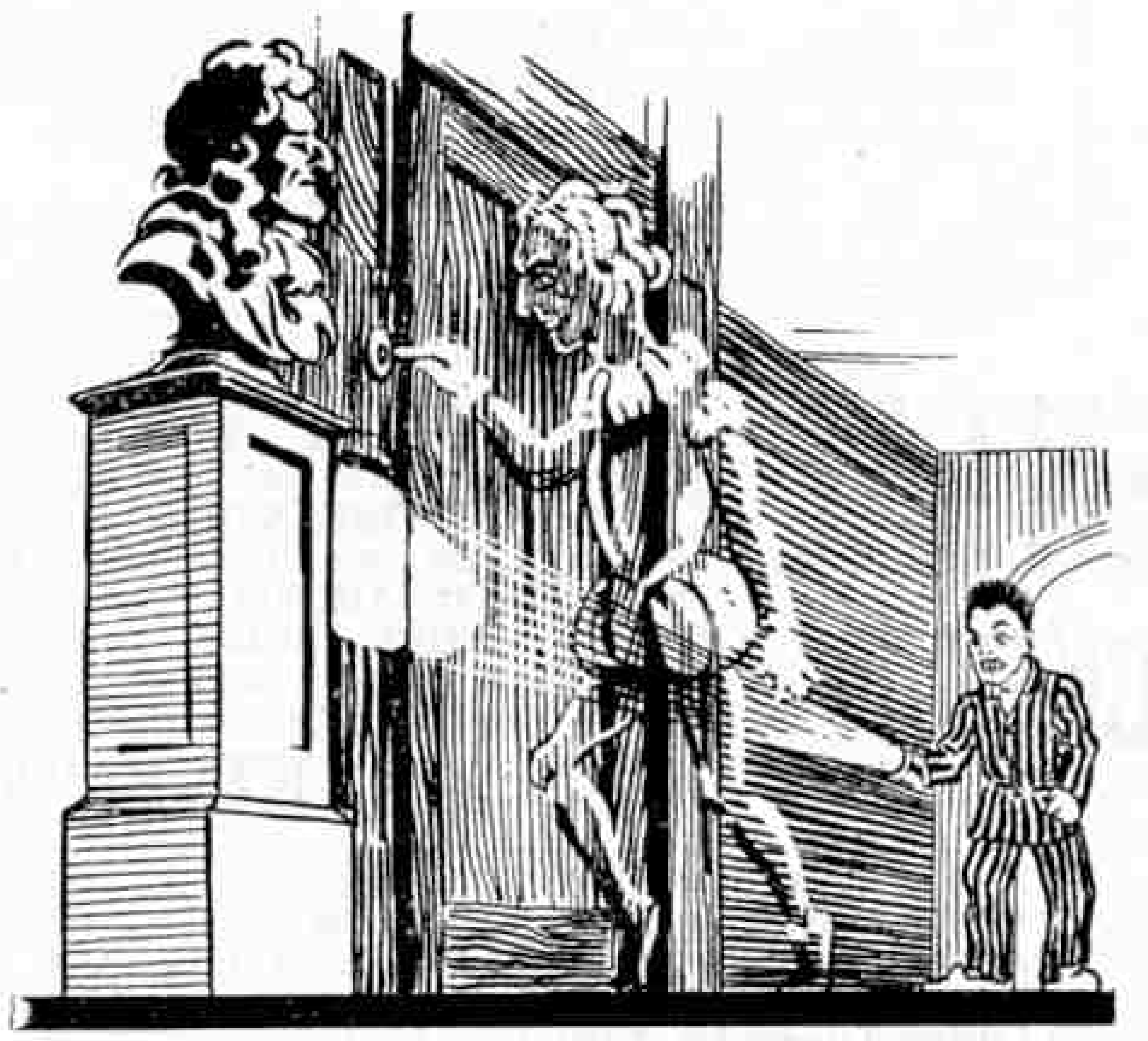
Waiter: "Only until somebody orders the other half, sir. We can't go out and kill half a duck."

* * * *

"No, I can't give you an appointment for this afternoon; I have eighteen cavities to fill," said the dentist as he turned from the telephone and picked up his golf clubs.

* * * *

UP WITH THE TIMES



Squire (re-visiting old Manor): "And how is my great-uncle, Sir Giles, the ghost who used to walk up and down the stairs all night?"

New Owner of Manor (who has had the place modernised): "Oh, the ghost! He doesn't give us a wink of sleep, ringing for the lift!"

* * * *

"Bring the baby in to tea, now," said mother to Jimmy, who was in the garden with baby.

"I don't think he wants any, mother," replied Jimmy, wiping the soil off his hands. "He's just had five worms."

* * * *

"Yes, the doctor allows me to smoke only two cigars a day."

"Hard lines, old chap."

"Well, it's not so hard, really. You see, I go to two other doctors and they each allow me the same number."

* * * *

Motorist: "Excuse me, but are you the man who made that long drive from the last tee?"

Golfer (proudly): "Yes, I'm the man."

Motorist: "Are you sure it was you?"

Golfer (more proudly): "Yes, certain. Wonderful drive wasn't it? Nearly 300 yards I should think."

Motorist: "I don't know about that, but you owe me a new windshield and rear window."

* * * *

Mother: "Why don't you try to be a good little girl?"

Mary: "I do try, Mother—hard."

Mother: "I'm afraid you don't succeed very well, then."

Mary: "But, Mother, just think how bad I'd be if I didn't try at all."

* * * *

A young couple who had just married received many presents after establishing their home in a suburb. One morning, they received two theatre tickets, with a note which read: "Guess who sent these!"

On the appointed evening they went to the theatre, returning very late. To their astonishment everything of any value in the house had been carried away.

On a table in the dining room they found this note "Now you know!"

ASKING FOR TROUBLE

Sailor: "They've just dropped their anchor."

Visitor: "Gracious, I was afraid they would. It's been dangling outside for some time."

* * * *

"Your methods of cultivation are hopelessly out of date," said the youthful student of the agricultural college to the old farmer. "Why, I'd be more than surprised if you got even ten pounds of apples from that tree."

"I should, too," replied the farmer. "It's a pear tree."

* * * *

"Smith wants to borrow a fiver from me," said Jones to his friend. "Do you know anything about him?"

"Yes," replied the friend. "I know him as well as I know you. Don't lend him anything."

* * * *

The government official of the country district who was in charge of the census of farm stock, had instructed the old farmer to collect his stock of every description and have them branded.

"I suppose I must if you say so," said the farmer ruefully, "but I can tell you I'm going to have a terrible time with them bees."

* * * *

The aspiring poet called on the publisher who had published his first book.

"Have you received any expressions of public opinion on my new volume?" he asked hopefully.

"Well," replied the publisher mournfully, "one man with the same name as yours has asked me to announce that he is not the author. Good-day!"

* * * *

A tourist seated outside an hotel in Florida was watching a negro porter as he swept the floor. Deftly but slowly the man made little piles of the scattered cigarette ends, half-burnt matches, and litter which had accumulated the night before.

"Sambo," said the tourist, "don't you think there is an excessive amount of humidity in the atmosphere to-day?"

"What's dat?" exclaimed the negro, wiping the perspiration from his face.

"I was merely extending an interrogation to learn if you thought it was going to rain," answered the tourist.

"Well, I nevah!" said the porter. "Does you reckon I would be wastin' my time pushin' dis broom if I had sense enuff to prognosticate de precipitation?"

* * * *

"Yes," said the farmer, "I've eaten beef all my life."

"But do you think it has done you any good?" the visitor asked.

"Good?" he returned confidently. "I feel as strong as an ox."

"That's strange," she ventured. "I've been eating nothing but fish for about three months, and I can't swim a stroke."

* * * *

HANDICAPPED

The country parson stopped to talk to one of his parishioners.

"Why are you looking so glum, George?" he asked.

George, who was noted throughout the village as its most cheerful inhabitant, continued to look sad.

"Got a new hat," he replied.

"But I should have thought that would be a matter for rejoicing," ventured the parson.

"Ah, maybe, sir," said George, "but every time I larf it falls off!"

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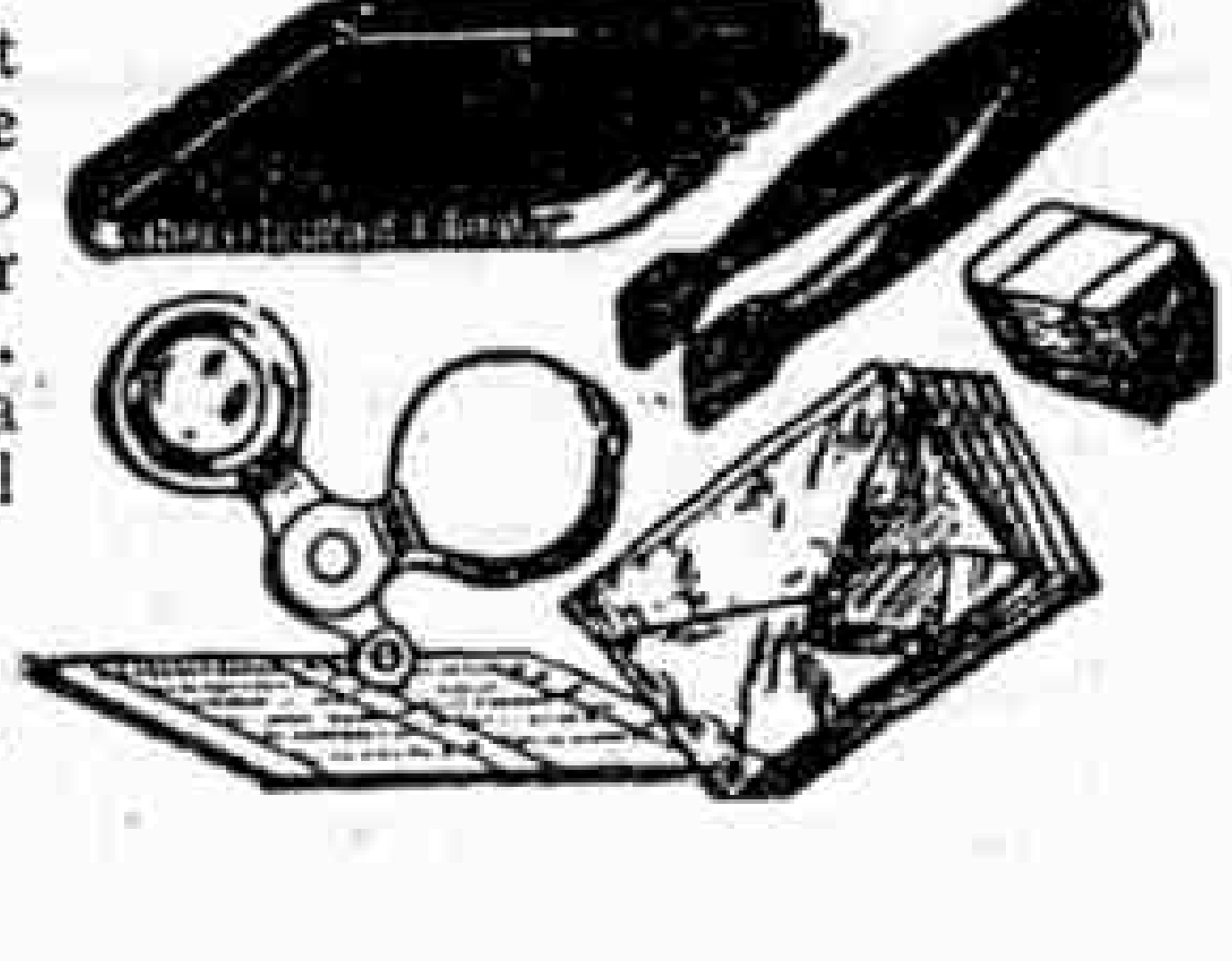


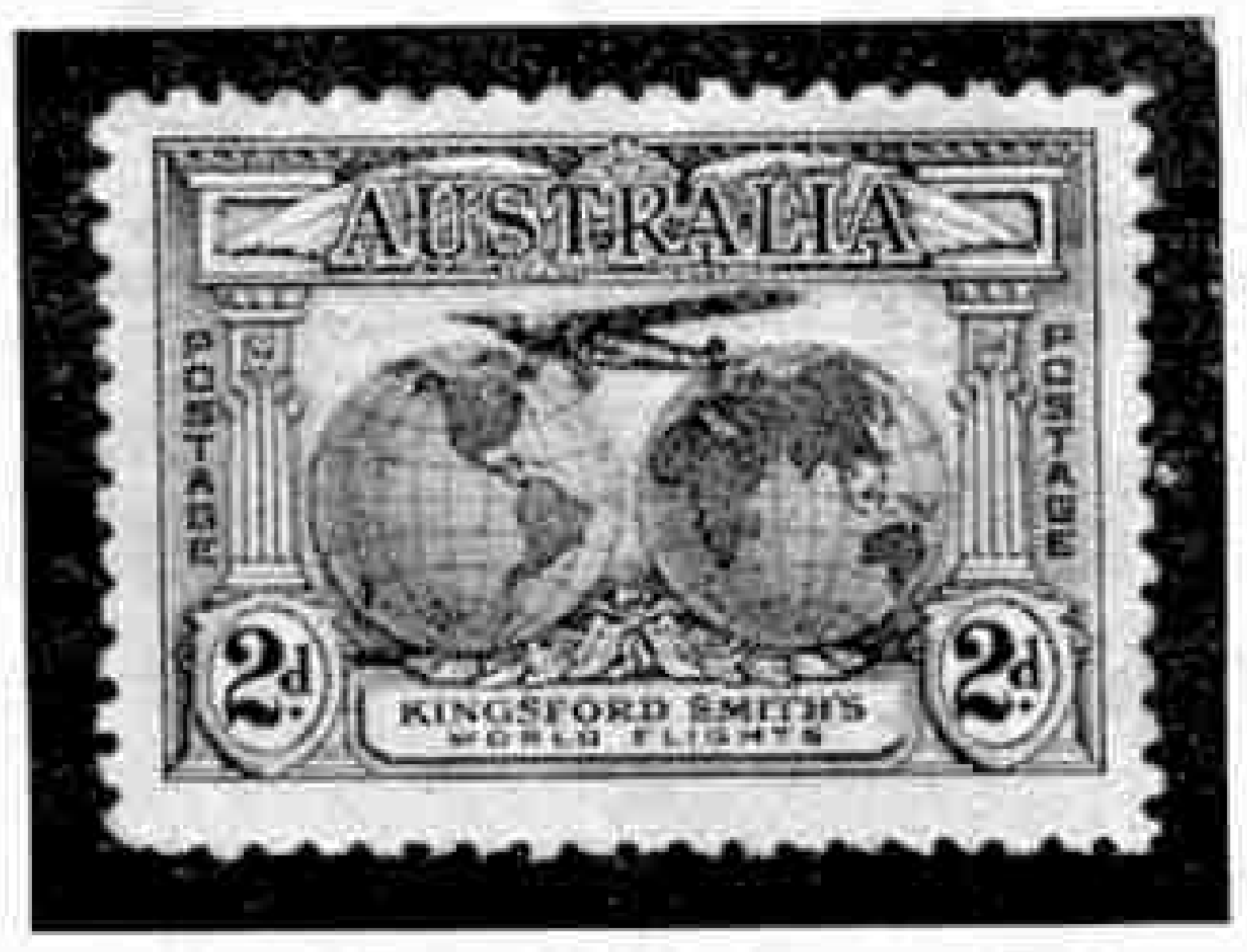
Stamp Gossip
and Notes on New Issues

The Kingsford-Smith Commemorative Issue

On this page we illustrate one of the stamps of the Australian commemorative issue celebrating the great world flights of Air Commodore Kingsford-Smith. There were three values, 2d., 3d., and 6d. The popularity of the issue may be gauged from the fact that the supply of the 6d. value was not nearly sufficient to meet the demand. Stocks in certain of the large cities were completely exhausted within two days of its appearance, and a second supply put on sale in Perth on 27th March lasted only ten minutes. It is understood that only 200,000 of the 6d. issue were printed, but there is a possibility of a second printing to meet the world-wide demand.

St. Anthony Commemoratives

In 1895, Portugal issued a set of stamps to commemorate the 700th anniversary of the birth of St. Anthony of Padua. This saintly monk died at the early age of 36, and thus it comes about that Italy recently issued a series of stamps in commemoration of the 700th anniversary of his death.



St. Anthony was born in Lisbon. Very early in life he became an Augustinian monk, but in 1220 he joined the Franciscan order and earned great fame along the Mediterranean coast as a preacher. His religious views almost bordered on fanaticism and it is related that on one occasion at Rimini, the people became so obviously tired of listening to him, that he turned to the sea and addressed the remainder of his sermon to the fishes. The legend continues that the fishes raised their heads above the water and listened carefully to every word! This incident is pictured on the 25c. stamp of the new series.

The issue consists of seven stamps, of which five depict incidents in St. Anthony's life. The other two show buildings with which he was associated. These are the 30c. and 50c. values, showing the Hermitage at Olivares, and the St. Anthony memorial church at Padua.

Of the remaining stamps the 20c. shows St. Anthony's initiation into the Franciscan Order; the 75c., the death of the saint; the 1L.25, the liberation of the captives; and the 5L.+2L.50, an allegorical picture of St. Anthony holding the Infant Christ in his arms.

A Contrast in Officialdom

We understand that Australia contemplates the production of a new 6d. air stamp. It is a curious commentary on this proposal that the combined air and postage fee on the internal services for which this stamp is intended to be used is only 5d. The official explanation of the 6d. issue is that on occasion letters are overweight, and the new stamp will meet the occasion!

This attitude of the Australian Postal Authorities provides a most remarkable contrast with that of British Postal officials, who quite flatly refuse to produce a special air mail issue "because its use would involve complications and tend to make the air mail services unpopular with the general public!"

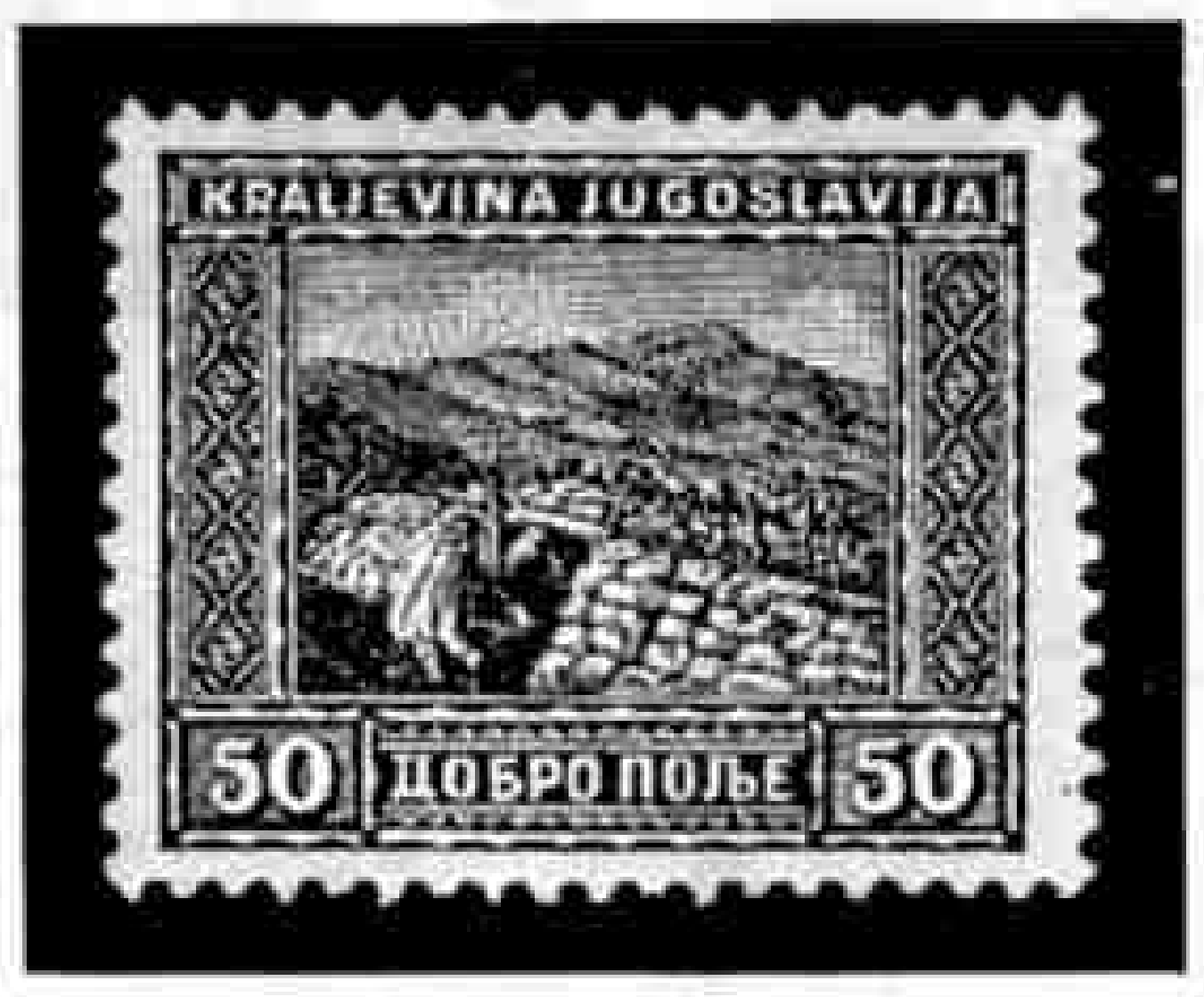
Pro Juventute 1931 Stamps

It is good news to learn that Switzerland has decided to proceed with the issue of pictorial designs for this year's Pro Juventute set, and subjects have been decided upon as follows :—5c., The Valley of Lauterbrunnen; 10c., The Lakes of the Upper Engadine; 20c., A Sketch of the Lake of Geneva; 30c., Alexander Binet, a famous Swiss Theologian.

A War Memorial Issue

The history of the Great European War is so boldly written across the pages of the stamp album that probably the easiest, and certainly the quickest, way of following the passage of events is to study the stamp designs of the combatant countries. The early triumphs and later miseries of the Central Powers, and the early struggles and subsequent triumph of the Allies may plainly be followed in the designs of the many provisional, commemorative and charity stamps that were issued.

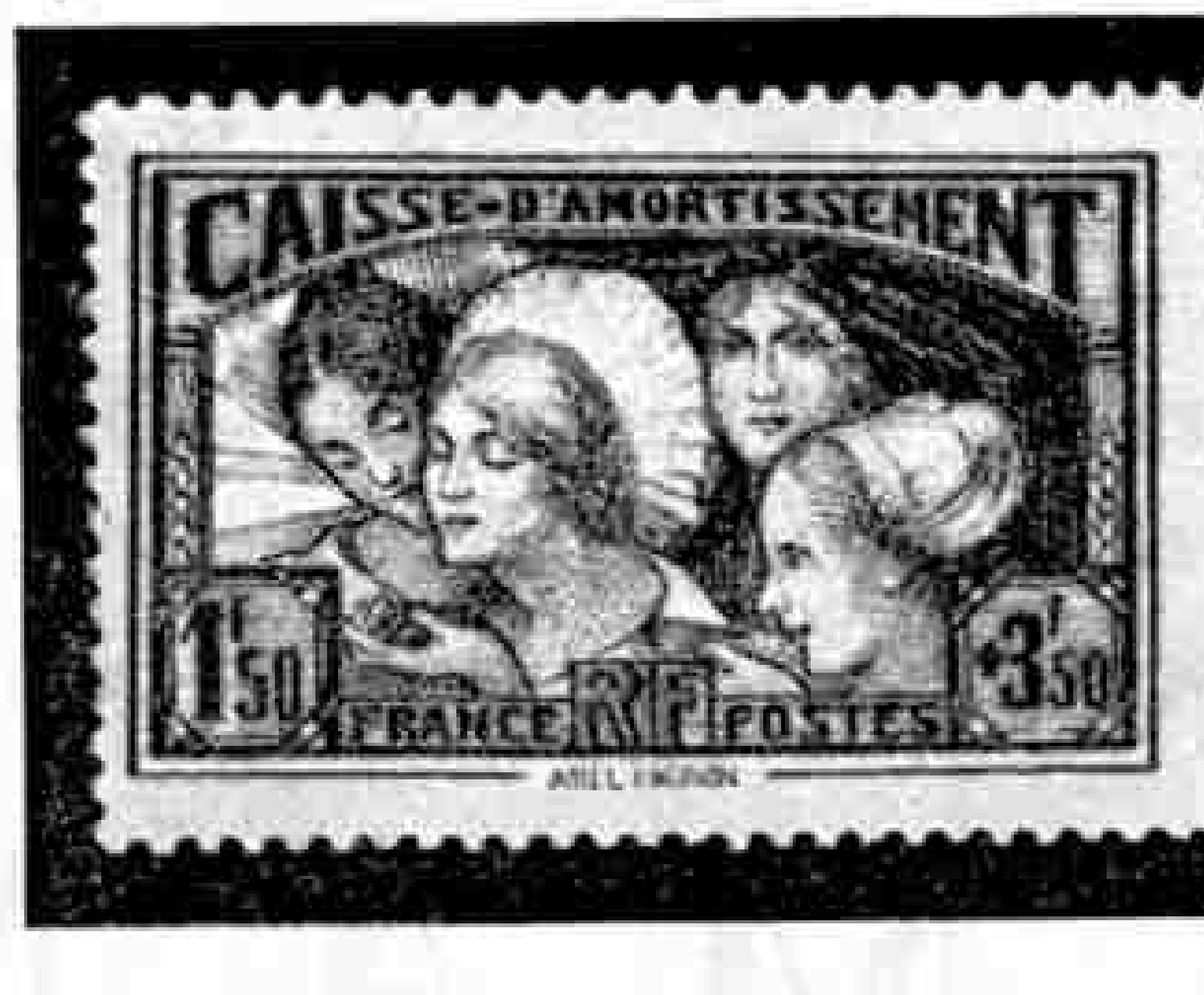
Many designs were based on battlefield scenes, but, strangely enough, few scenes of trench activity are available. The recent Jugo-Slavian charity issue—to raise funds for a Serbian War Memorial to be erected in Paris—is welcome, therefore, for one of the stamps, the 50 p.+50 p. illustrated here, gives an excellent impression of a war time trench, complete with barbed wire entanglements, and a steel helmeted sentry on guard at the entrance to a "dug out."



The remaining two stamps of this issue are a 1 d.+50 p. denomination illustrating the proposed Memorial, and a 3 d.+1 d., showing a tent bivouac on a snow-clad mountain side.

An Interesting Parallel

On a previous occasion we have remarked that stamp designers' ideas are apt to run in grooves, and an interesting confirmation of this statement is to be found in two designs illustrated on this page. The first shows the French 1931 Sinking Fund stamp, in which the design is the very attractive one of four typical French girls, one drawn from each of the following departments, Boulogne, Arles, Alsace, and Britanny. Each of the girls is depicted in the traditional costume of her district, and apparently France, in deciding upon this design, intends to use the subject in future Sinking Fund issues with a view to stirring up local patriotism.

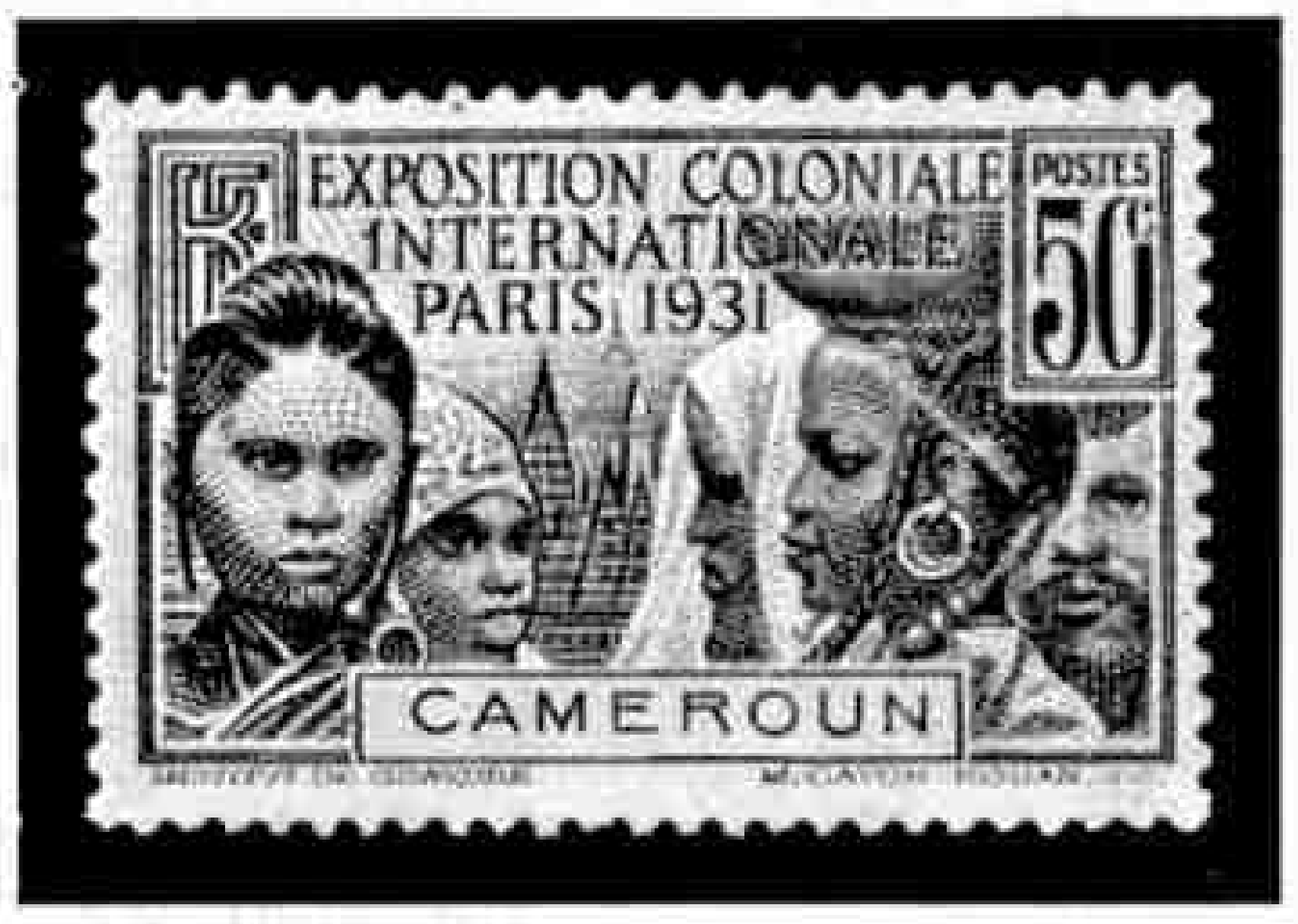


The stamp is issued with a nominal face value of Fr. 1.50, and is sold at a premium of Fr. 3.50.

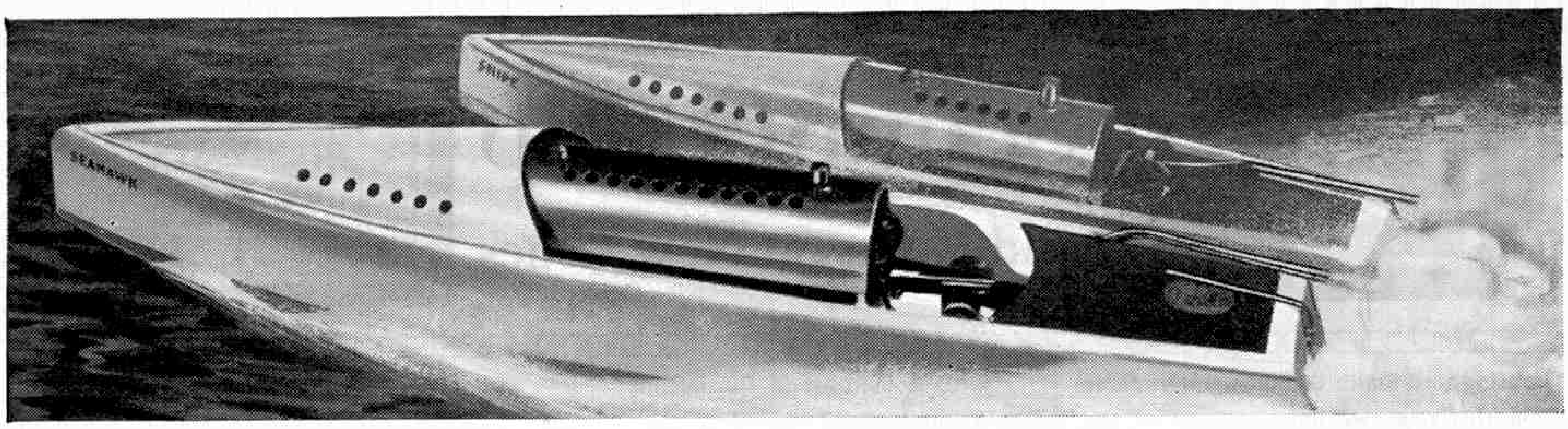
The second stamp illustrates one of a short series of four designs (for 40c., 50c., 90c. and Fr. 1.50 stamps) that is being used throughout the French Colonies to commemorate the International Colonial Exhibition now being held in Paris. It is the 50c. value and on it typical French Colonial girls are shown in native costume.

Russian Airship Issue

To help in the raising of funds for the building of a new airship, Russia has prepared an exceptionally fine set of stamps, which we hope to reproduce in an early issue.



There are five values in the series, 10K., 15K., 20K., 50K. and 1R. The 10K. value shows an airship flying over a plain with a camel on the left and a reindeer on the right. Presumably this is another instance in stamp illustrations of the contrast of modern and ancient methods of transport. In the middle portion of the design of this stamp is shown a factory, that is probably included as a reminder of the Five Year Plan to industrialise the country. An airship flying over a great reconstructed industrial area is seen on the 15K. stamp, while the 20K. and 1R. values show airships flying over the Kremlin and under construction respectively. The 15K. value shows an airship at the North Pole.



'Seahawk' ahead! . . . .

here she comes . . . long deck glistening with spray . . . you see the water whipped to foam and in a flash she's gone . . . she's won! And no wonder, for the "Seahawk" is far faster and steams far farther than anything she is likely to come up against. Her two miles at top speed is some going! The secret of her power is live steam, a really efficient double-power, twin-cylinder engine, and scientifically streamlined hull. The "Seahawk" is the senior launch of the Bowman fleet and is 28 inches long! You can see her at all Halford's and Hobbies branches and good shops everywhere. The SEAHAWK costs only 42/– (sister ships from 17/6).

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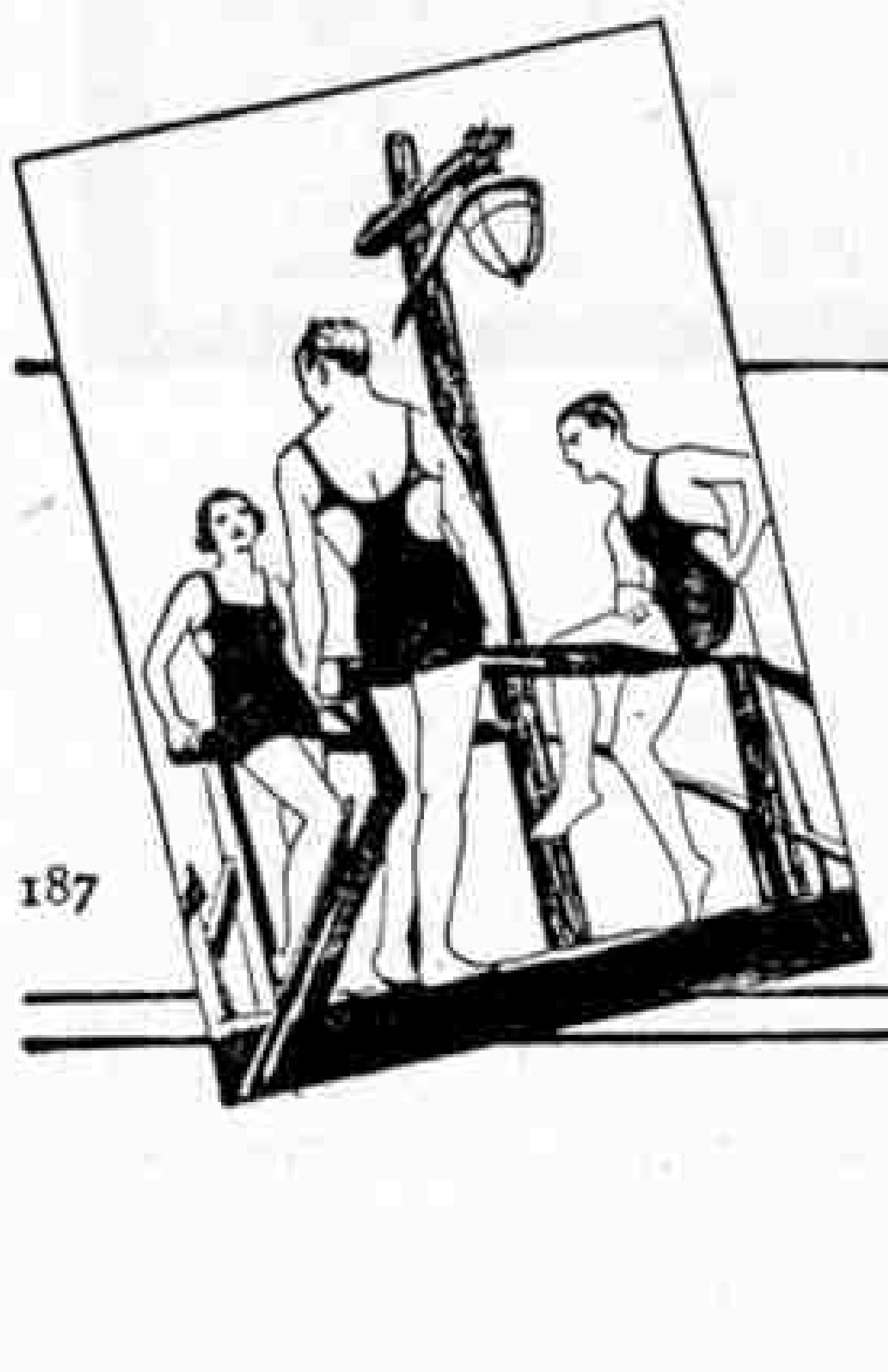

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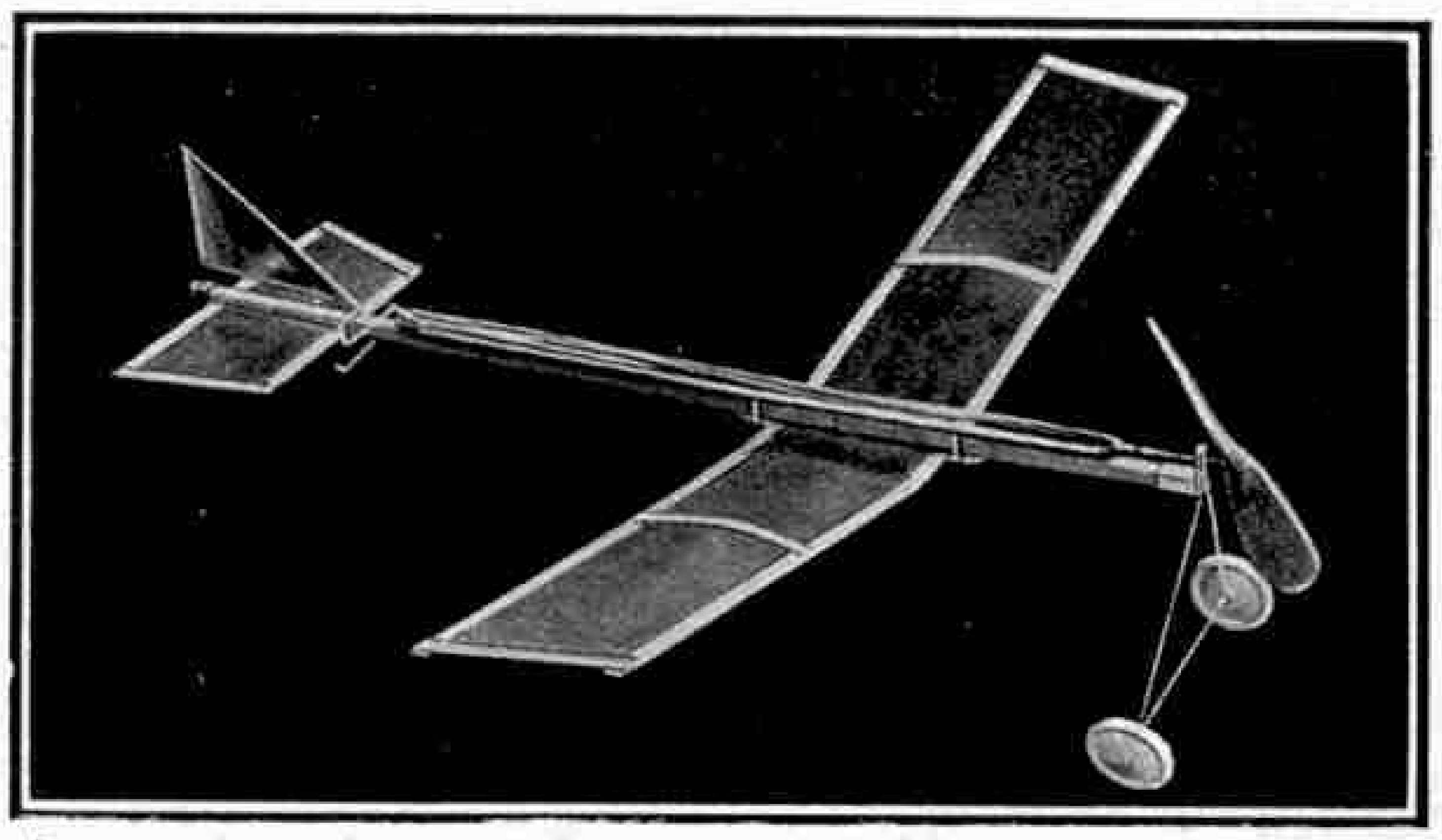

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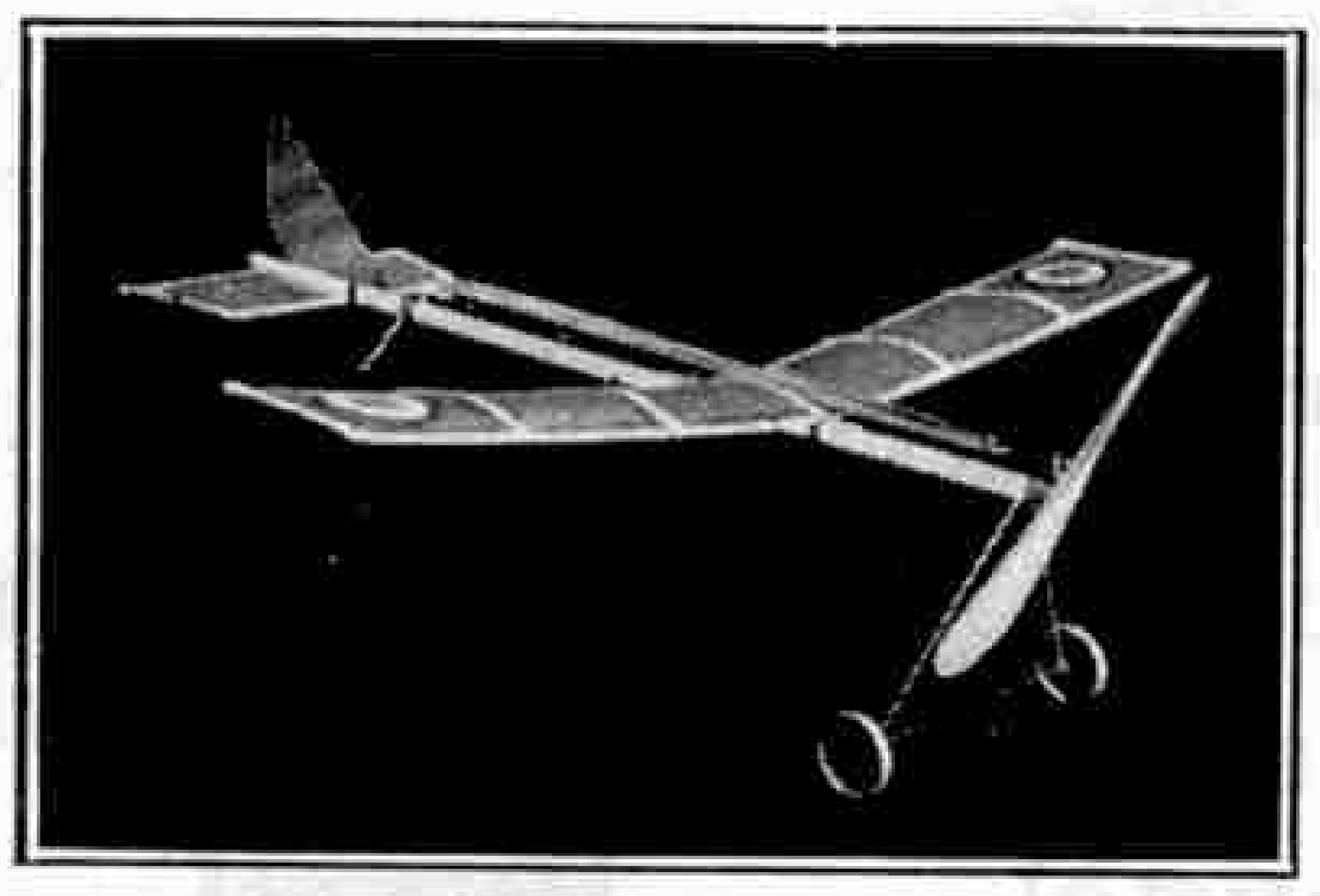

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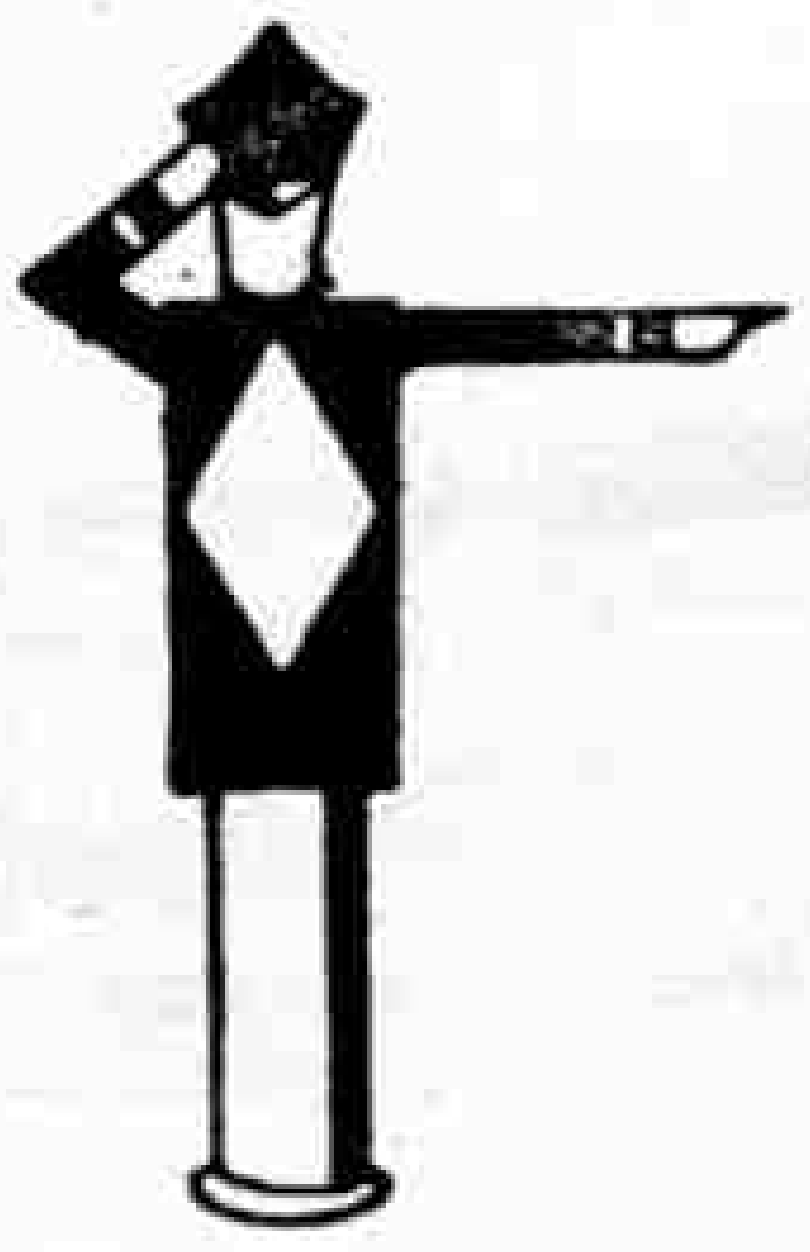

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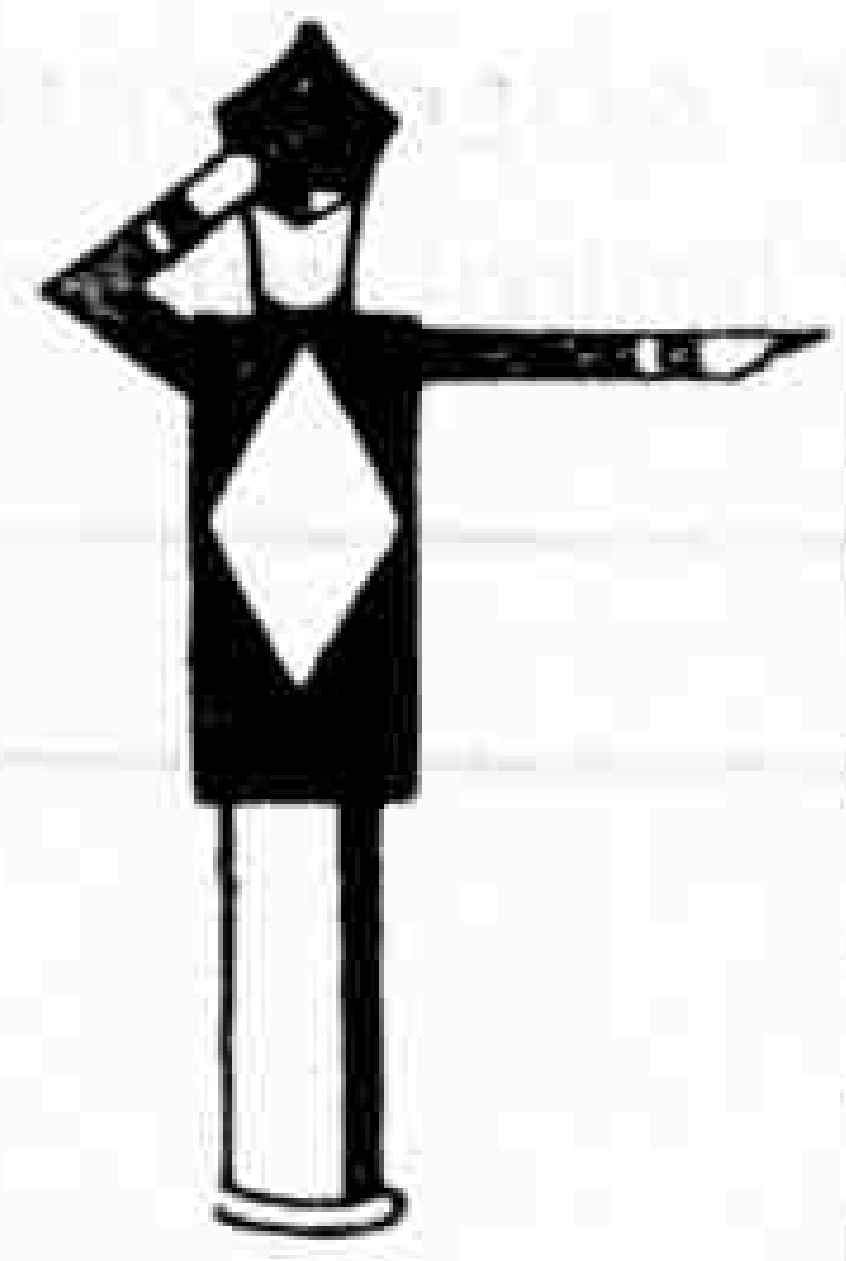

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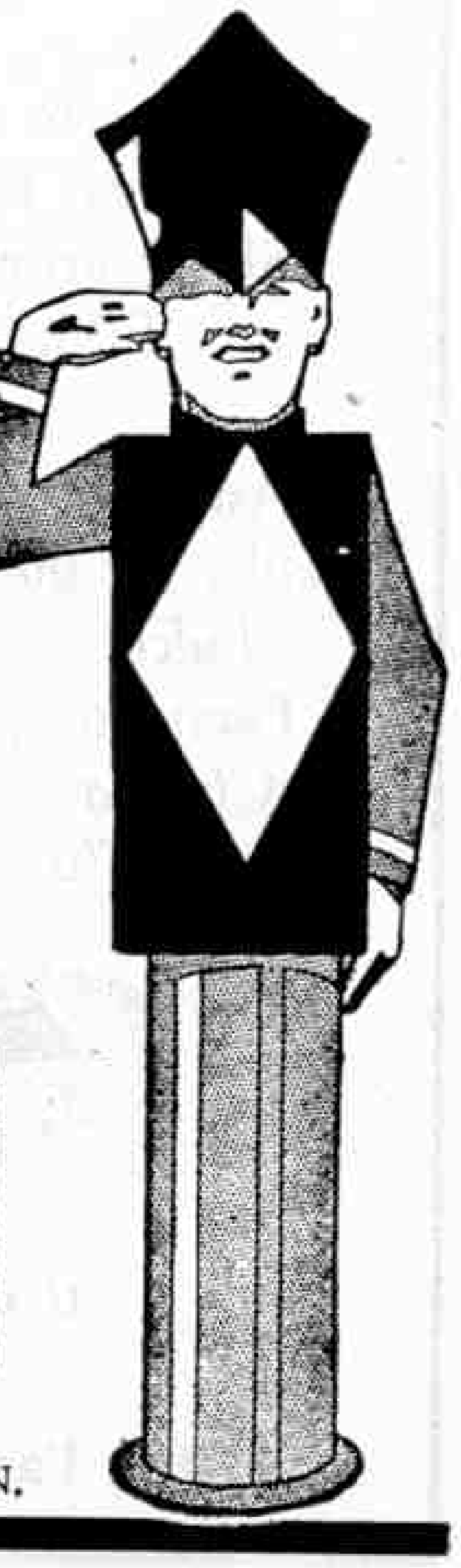

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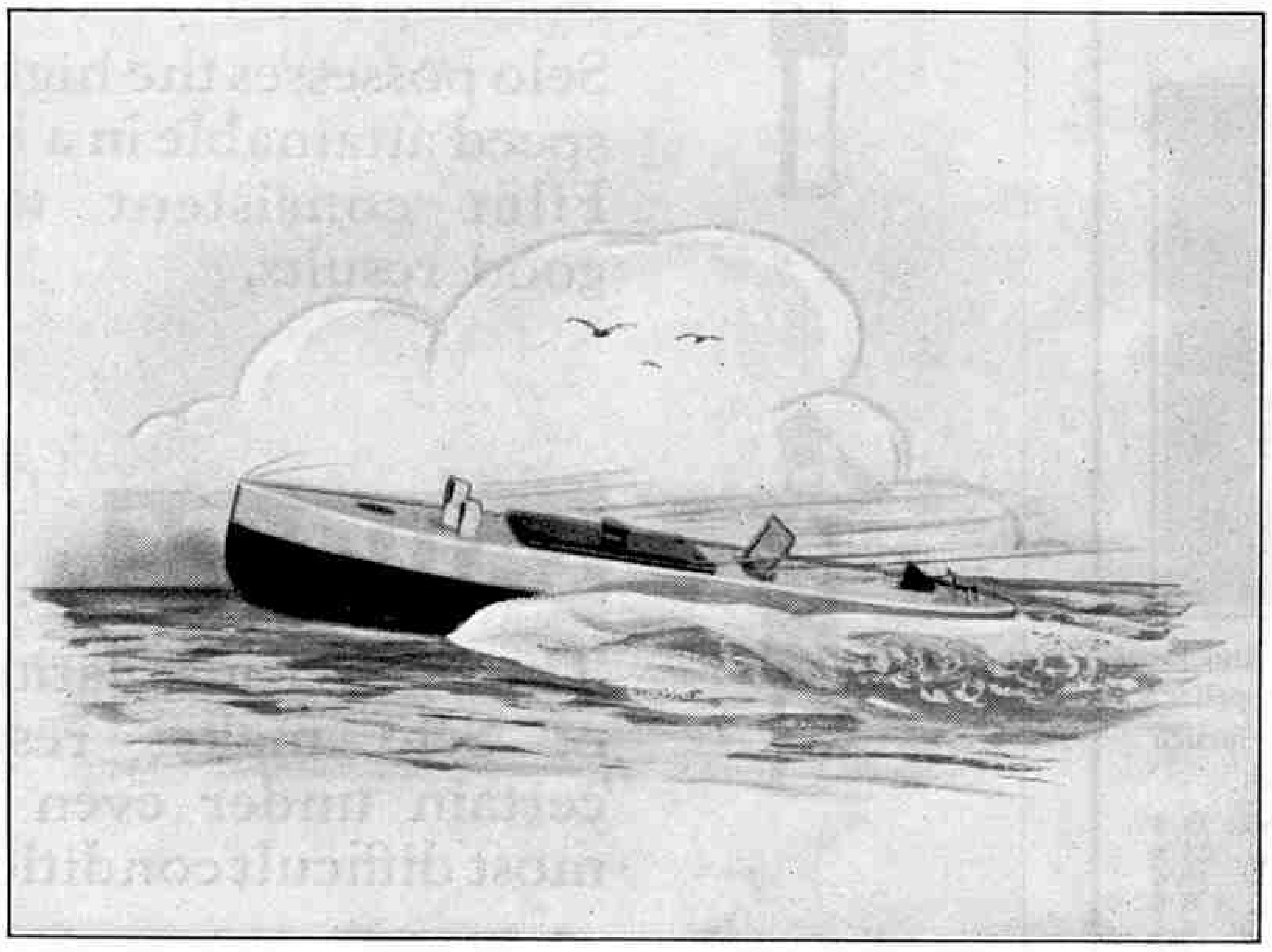

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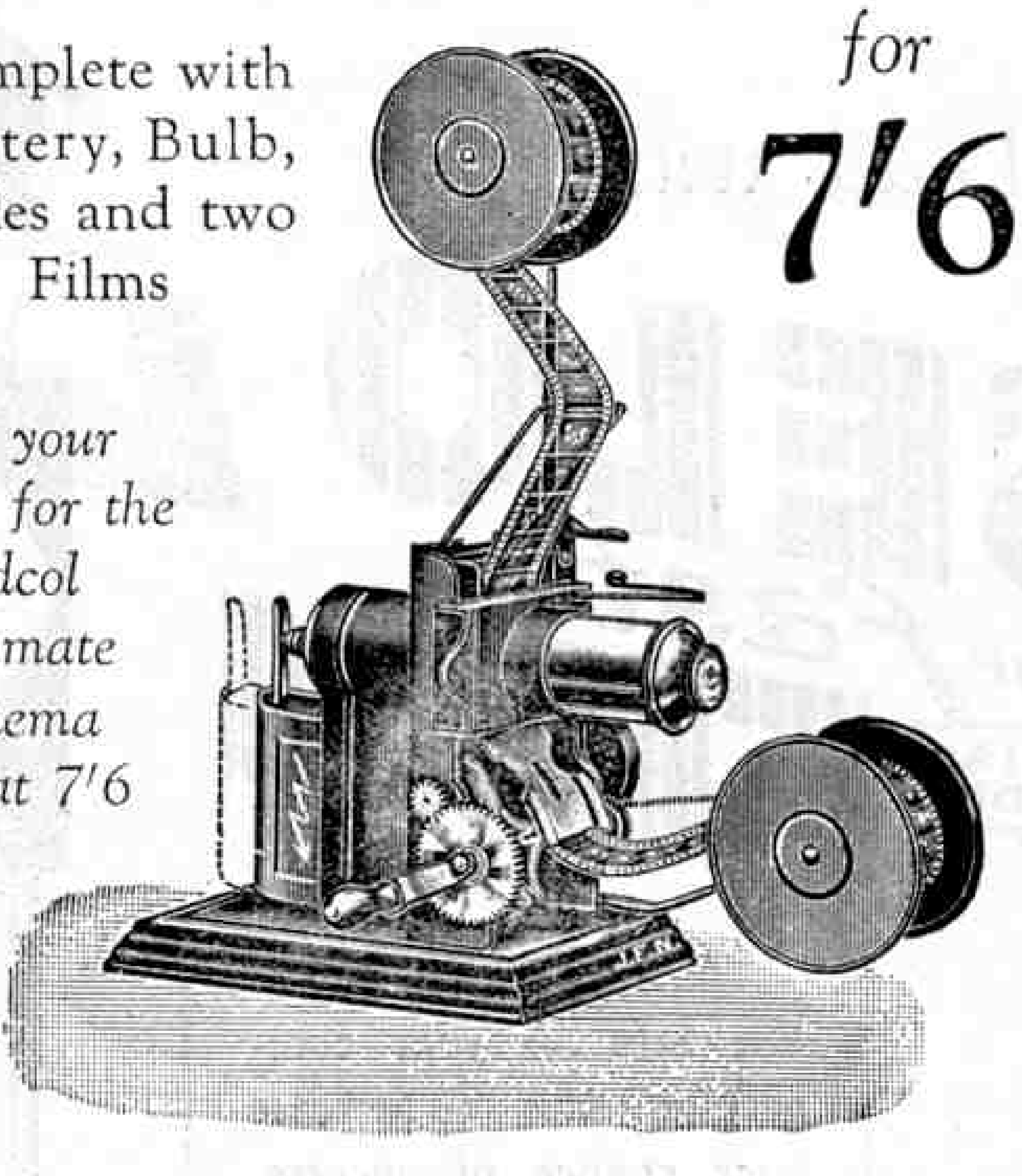

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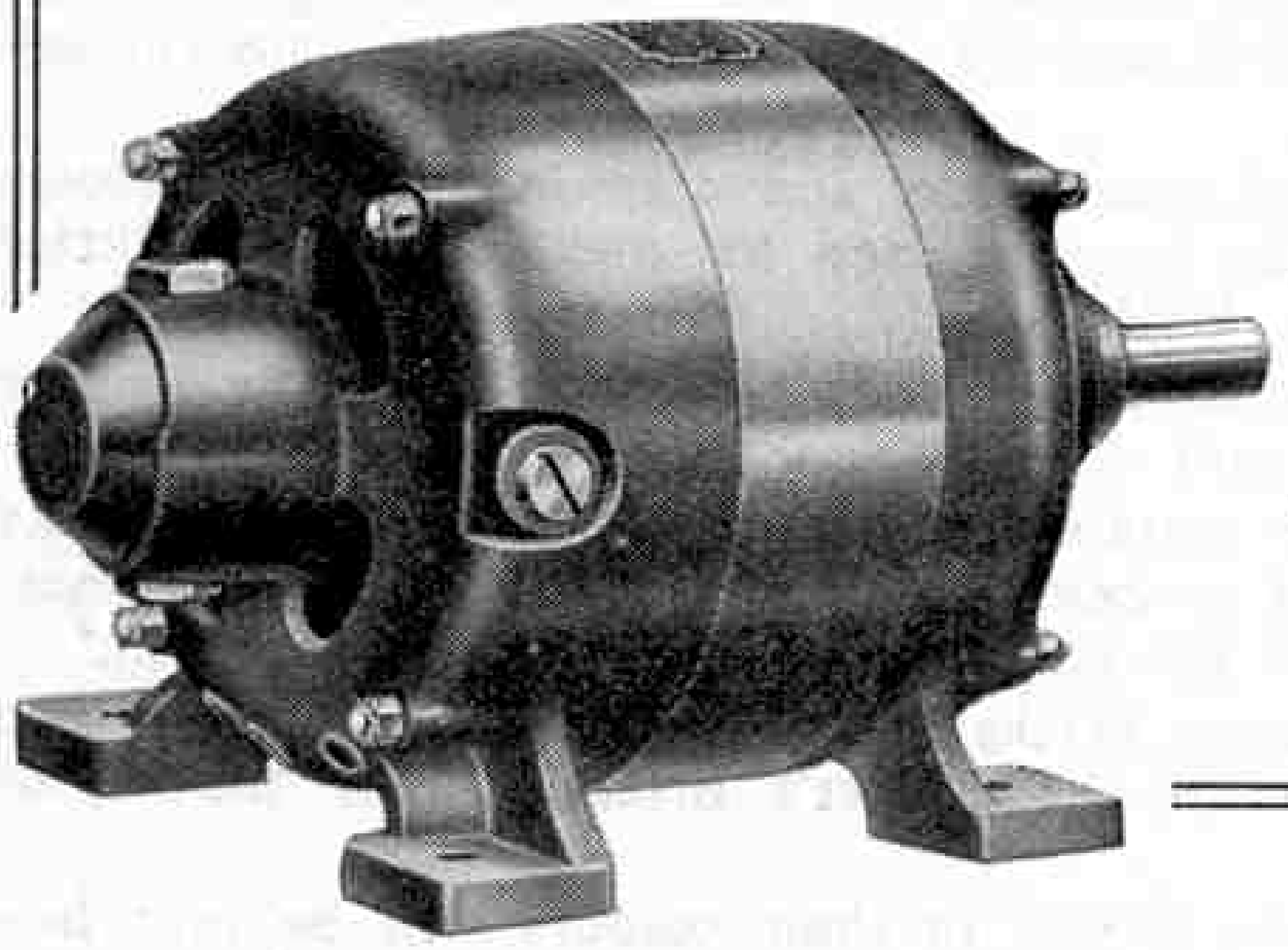

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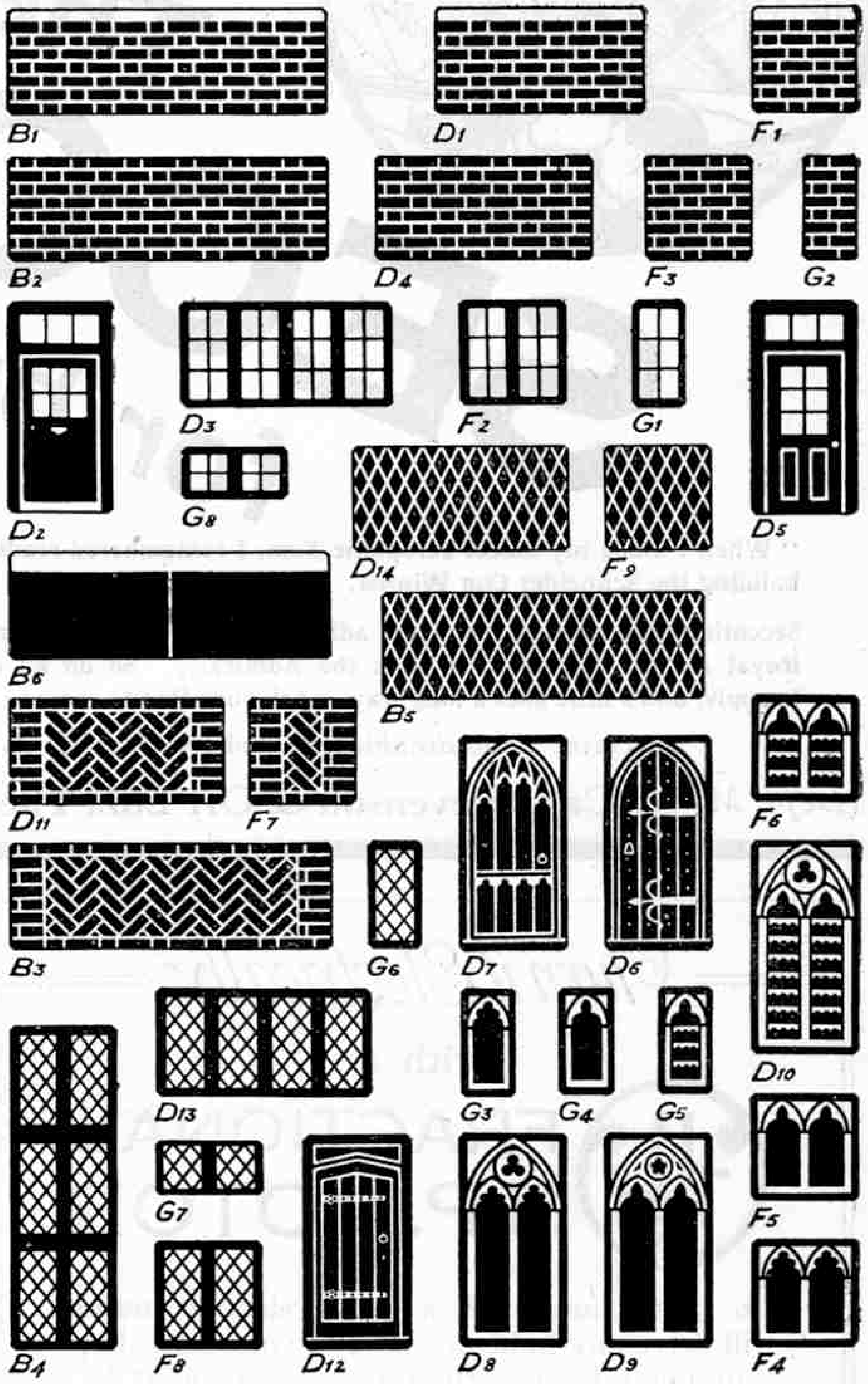

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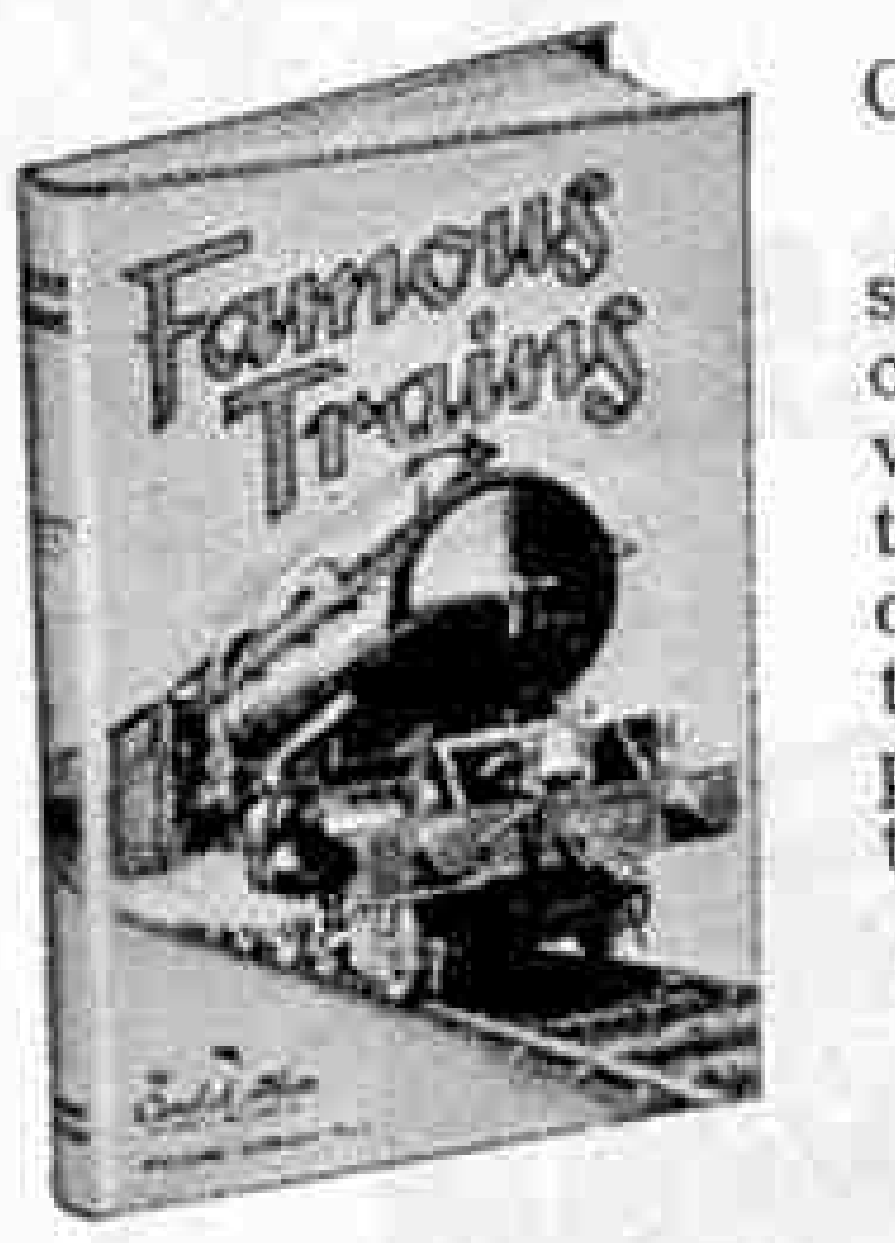

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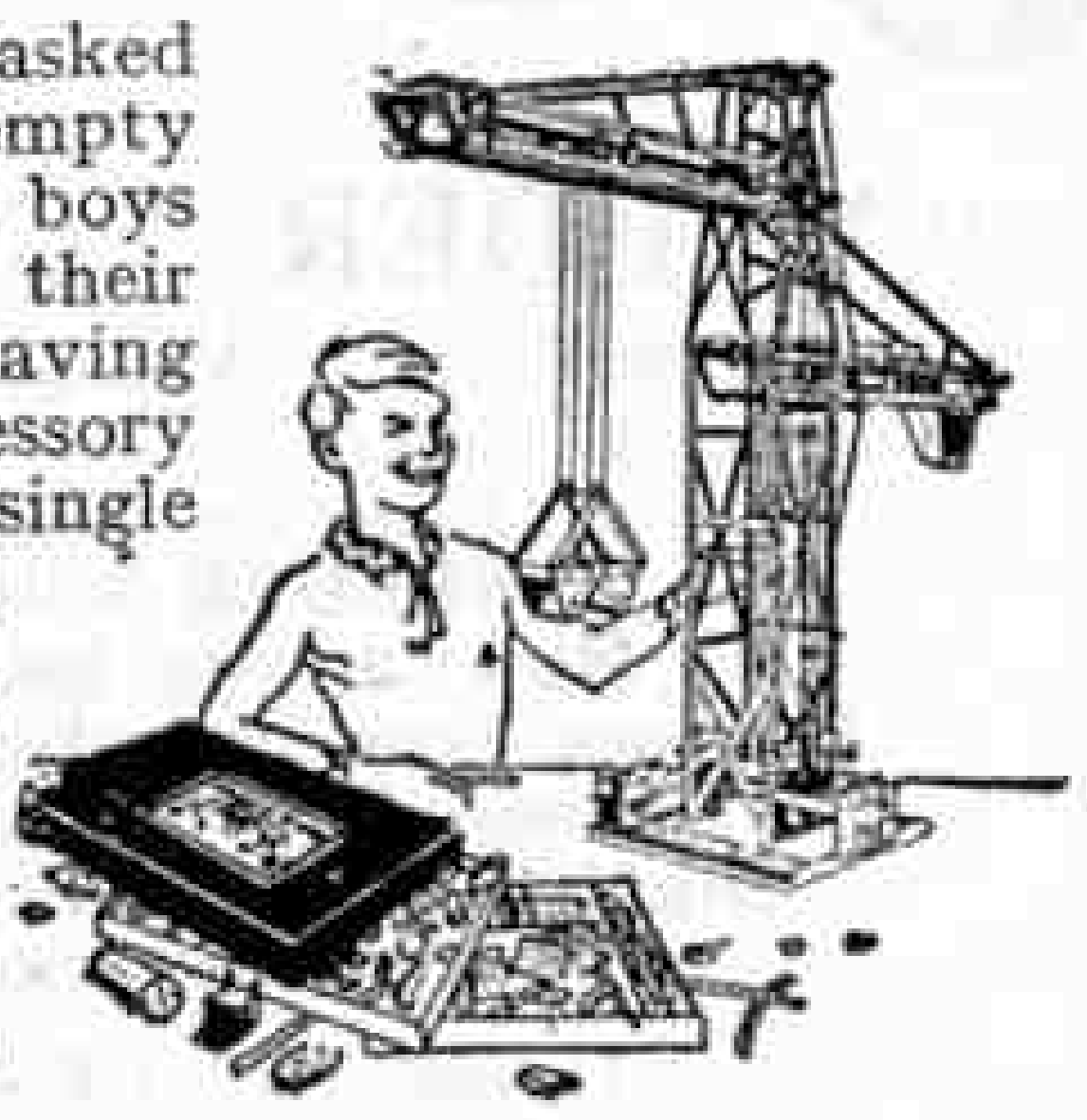

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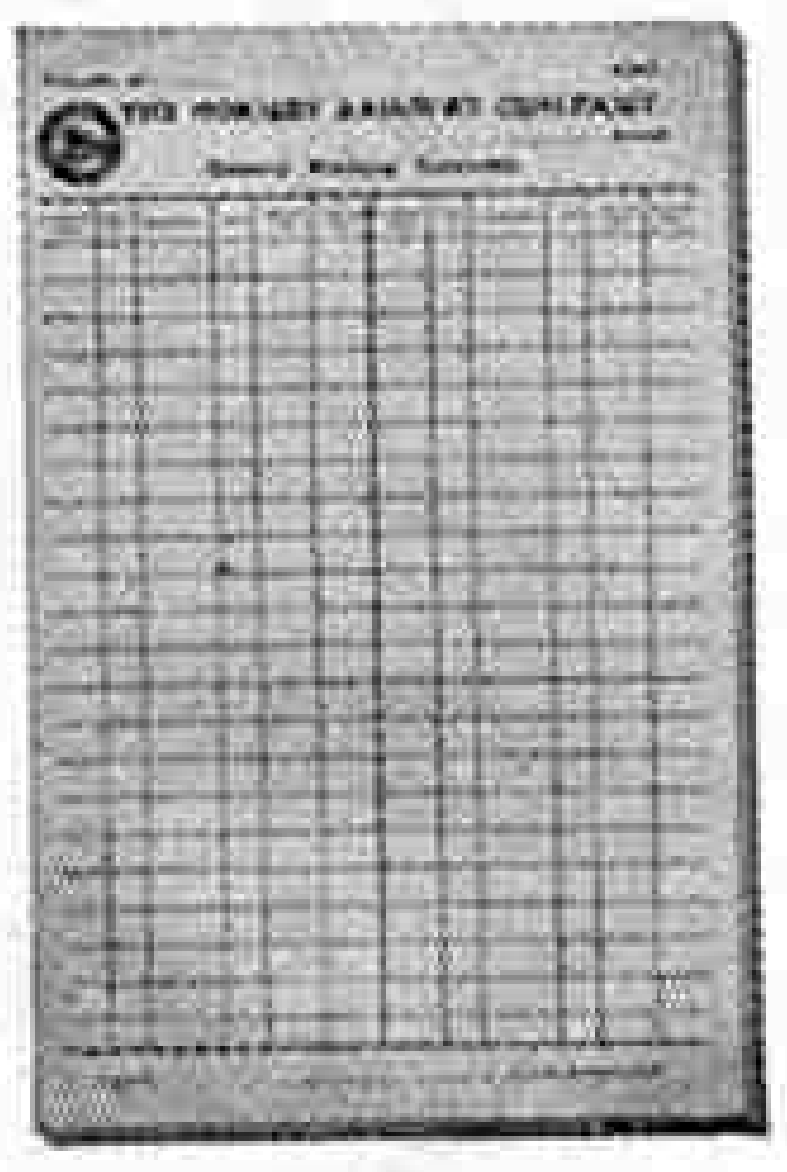

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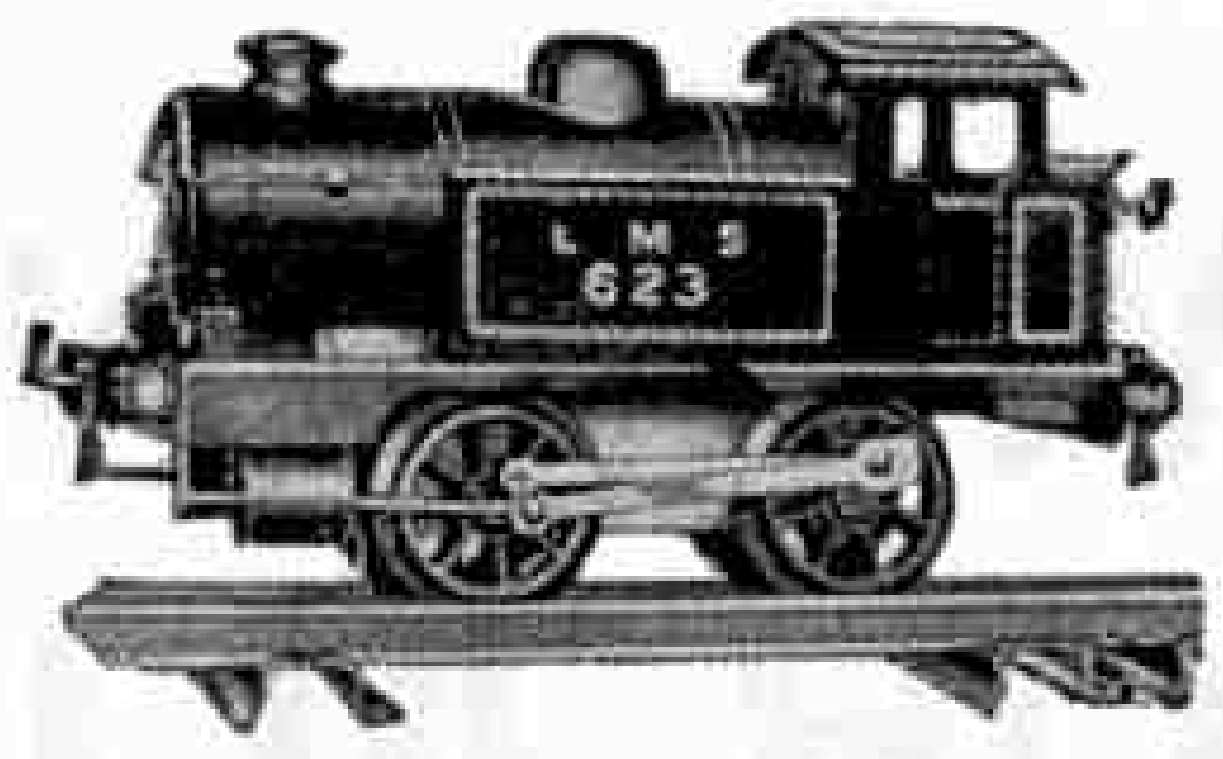

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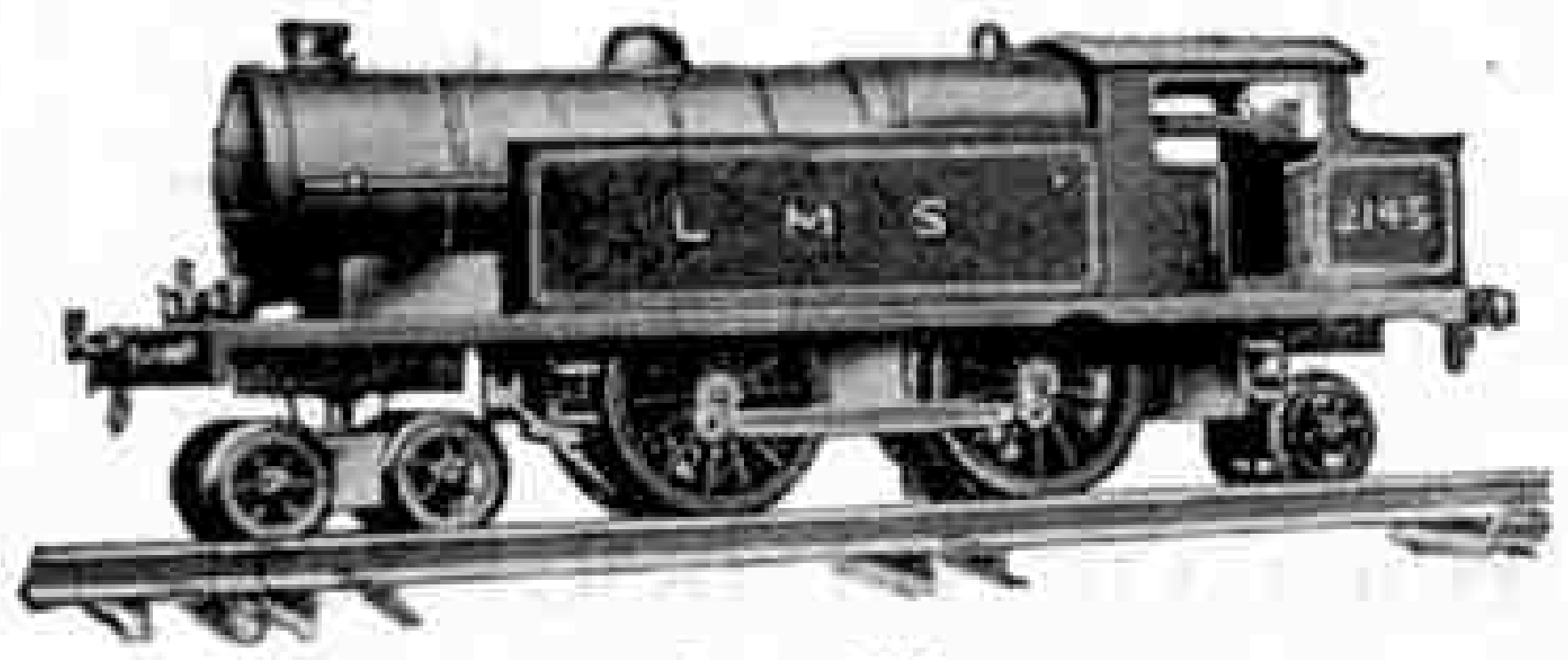

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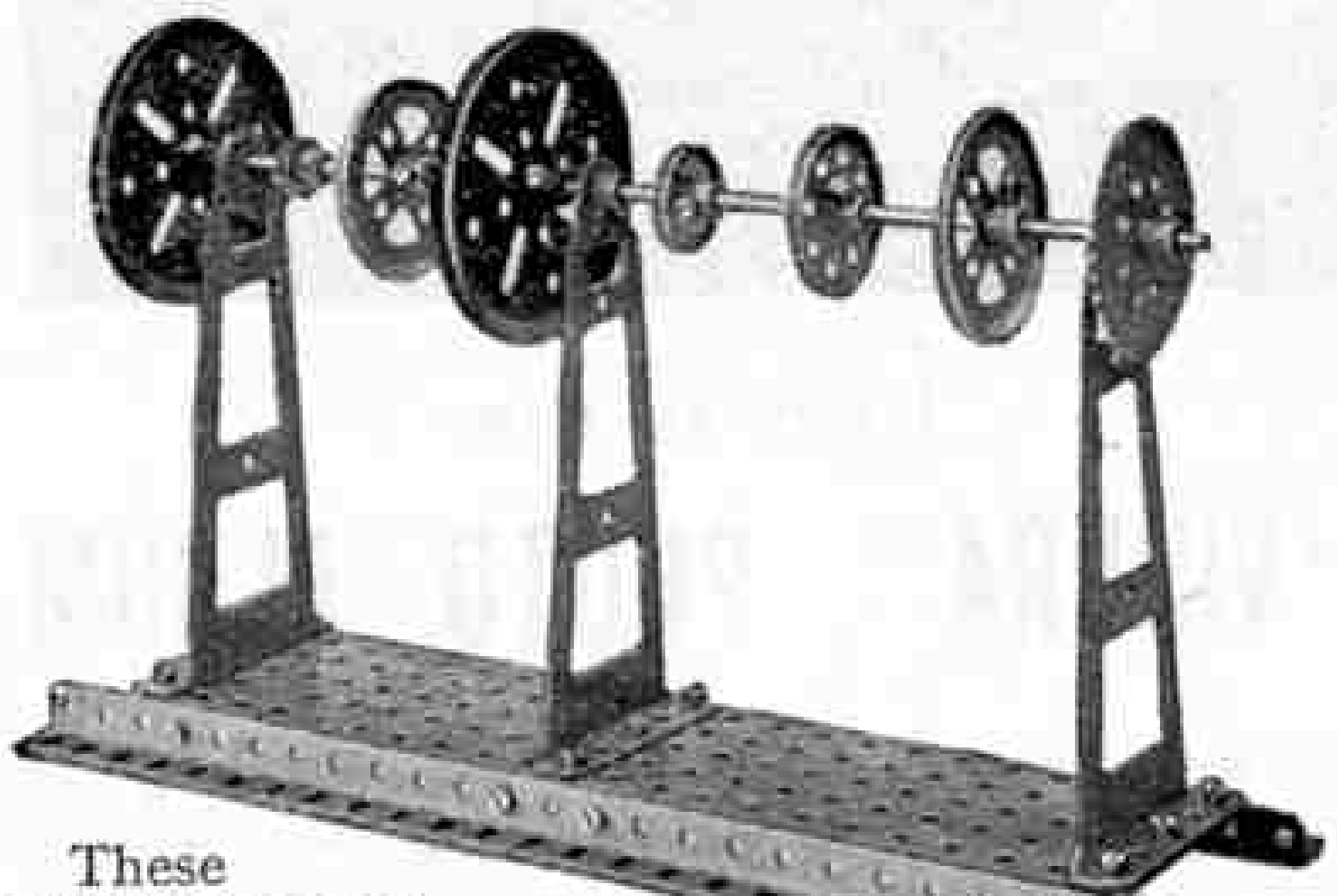

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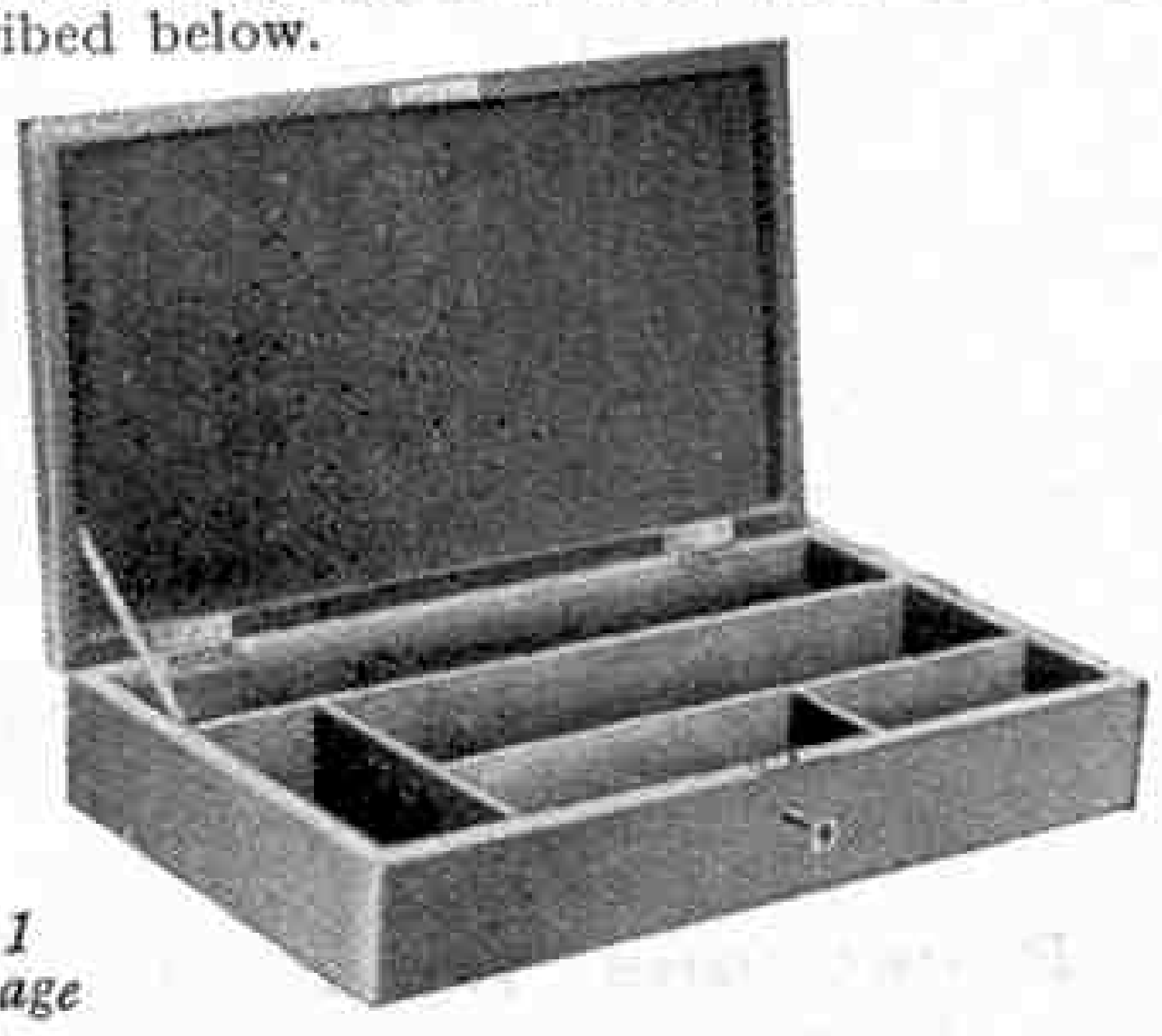

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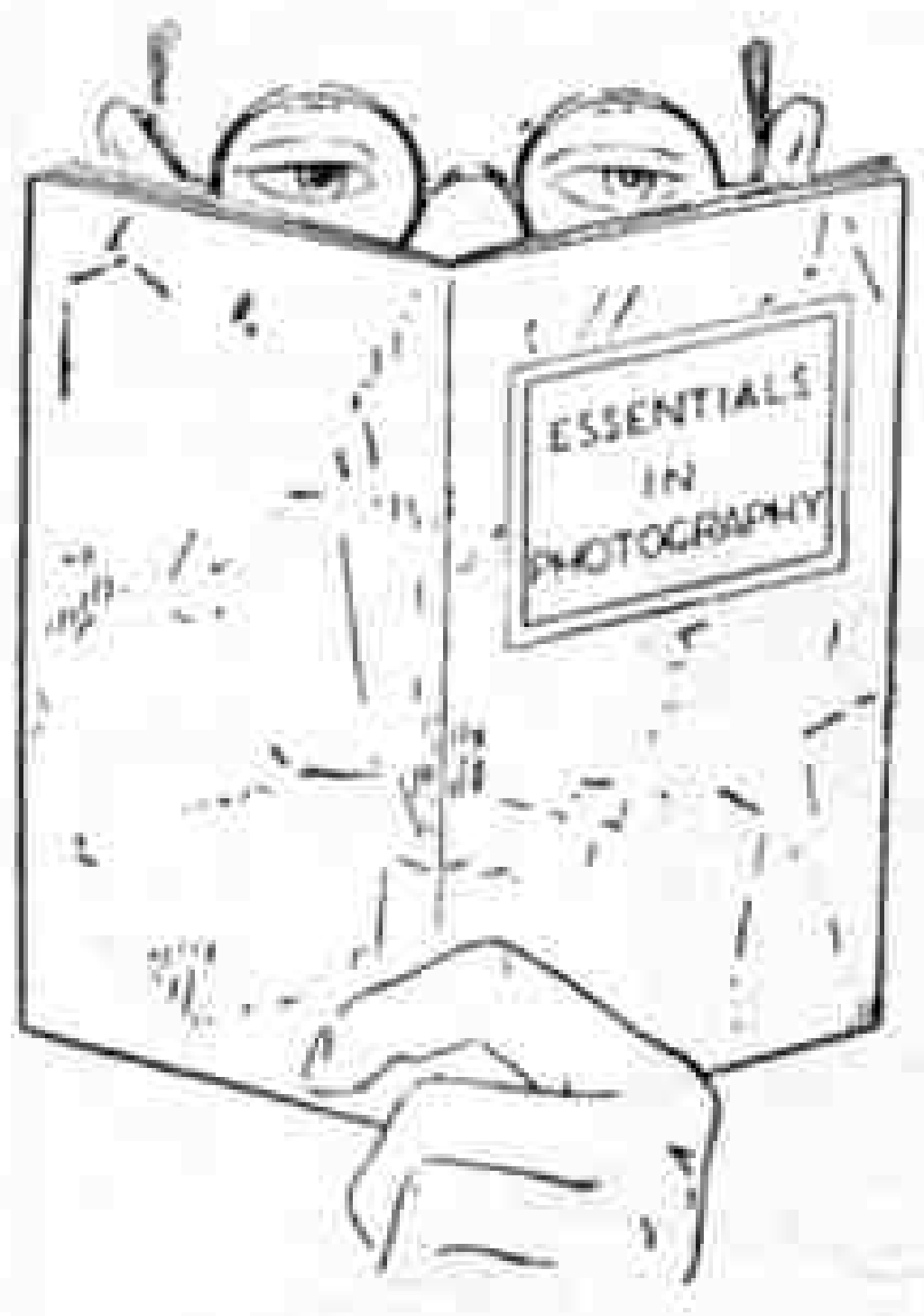

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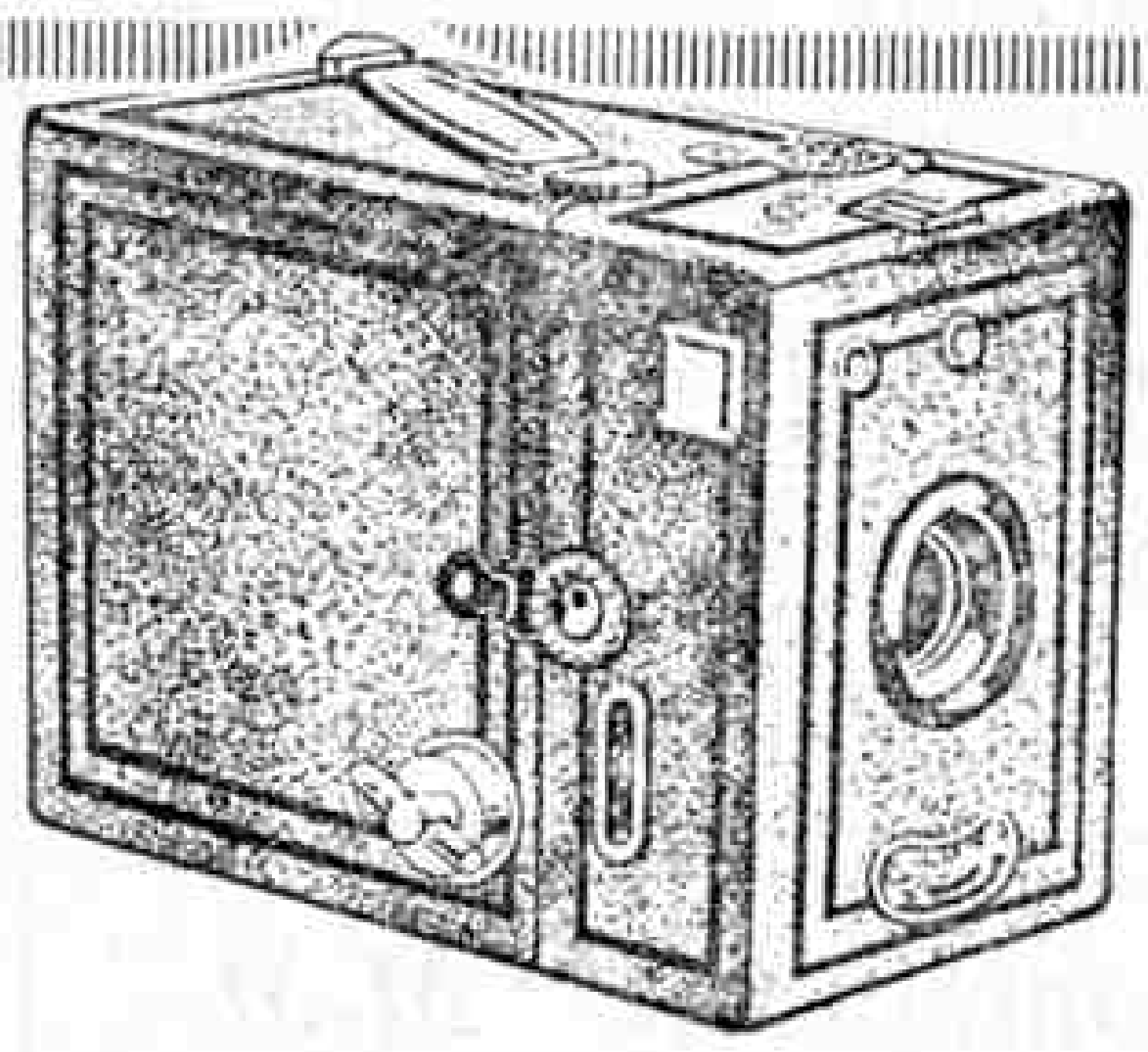

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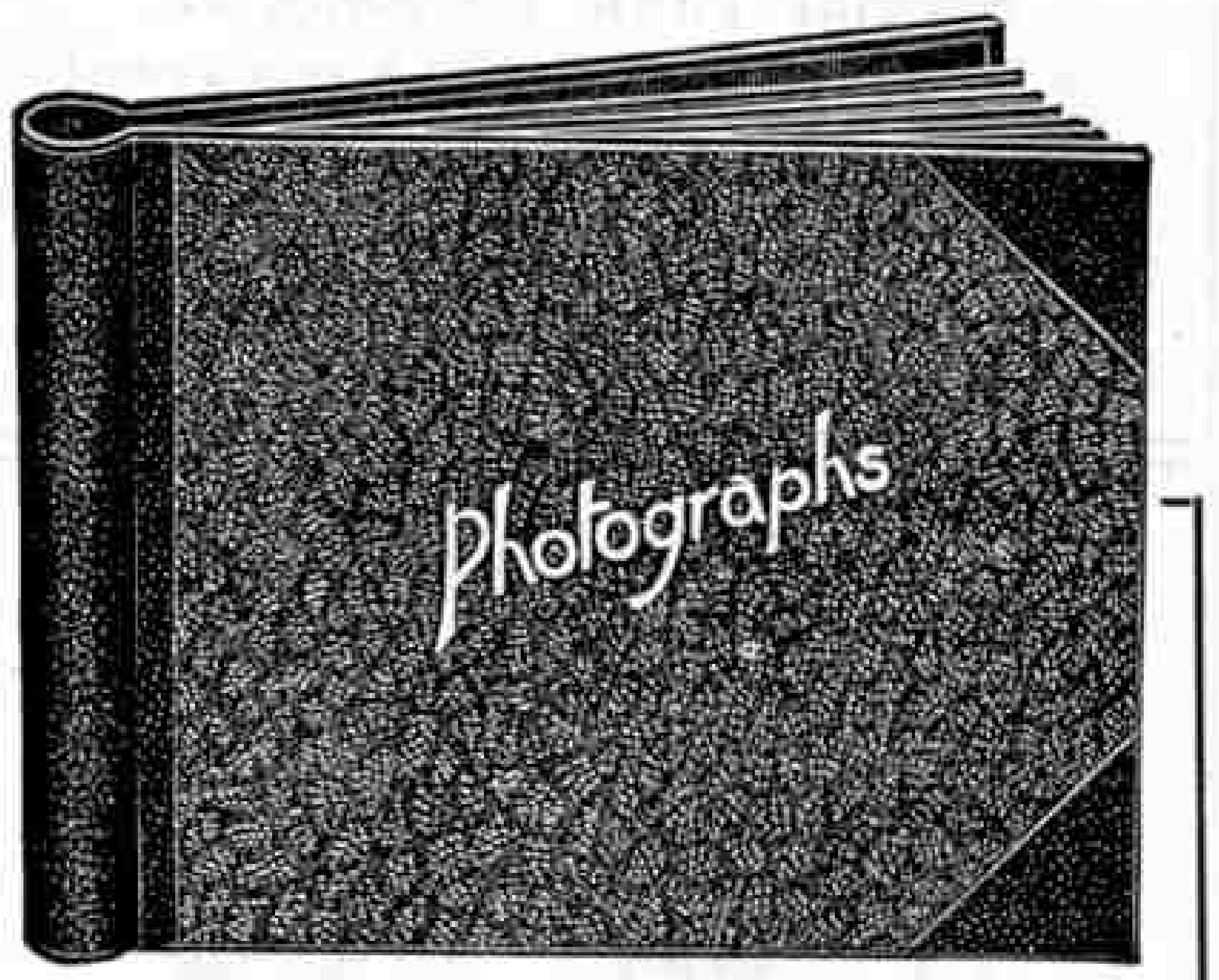

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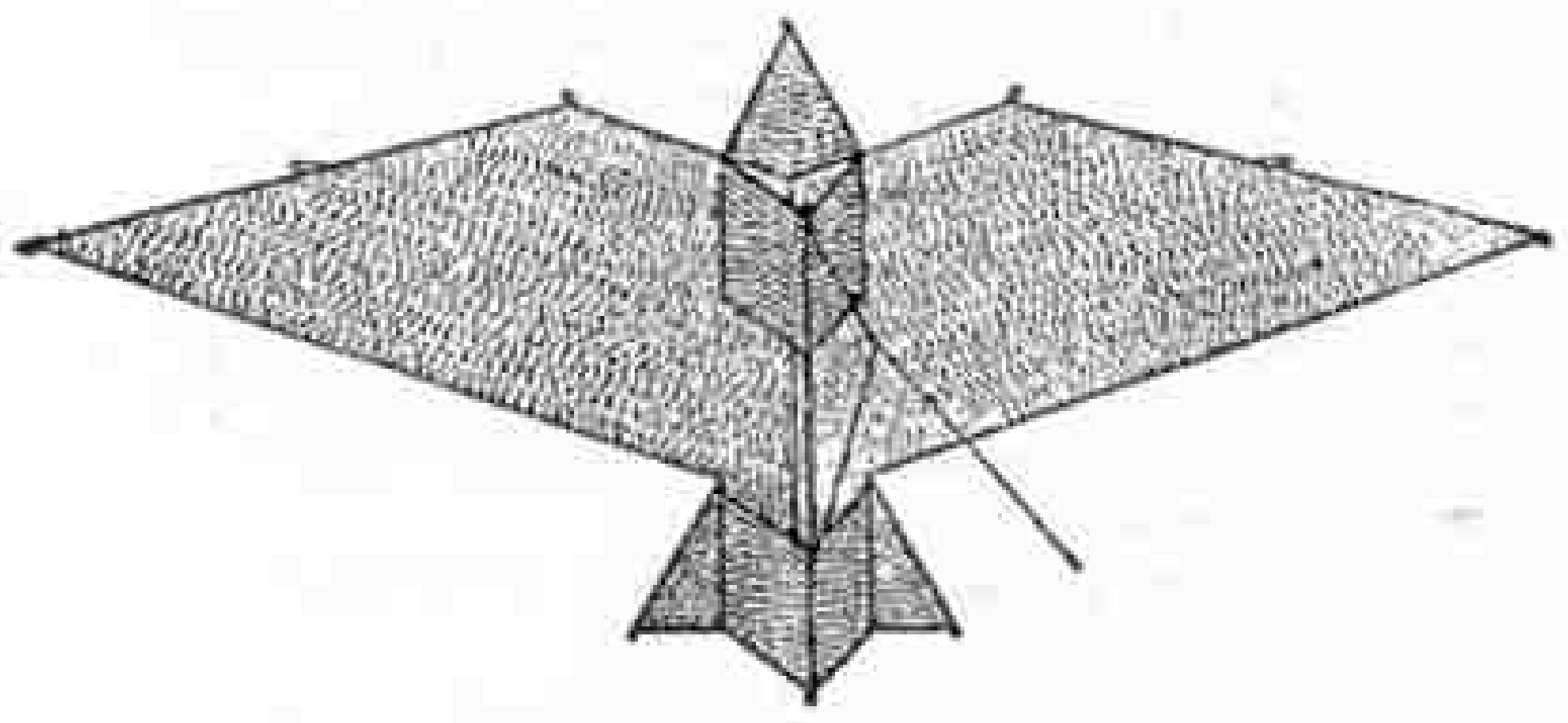

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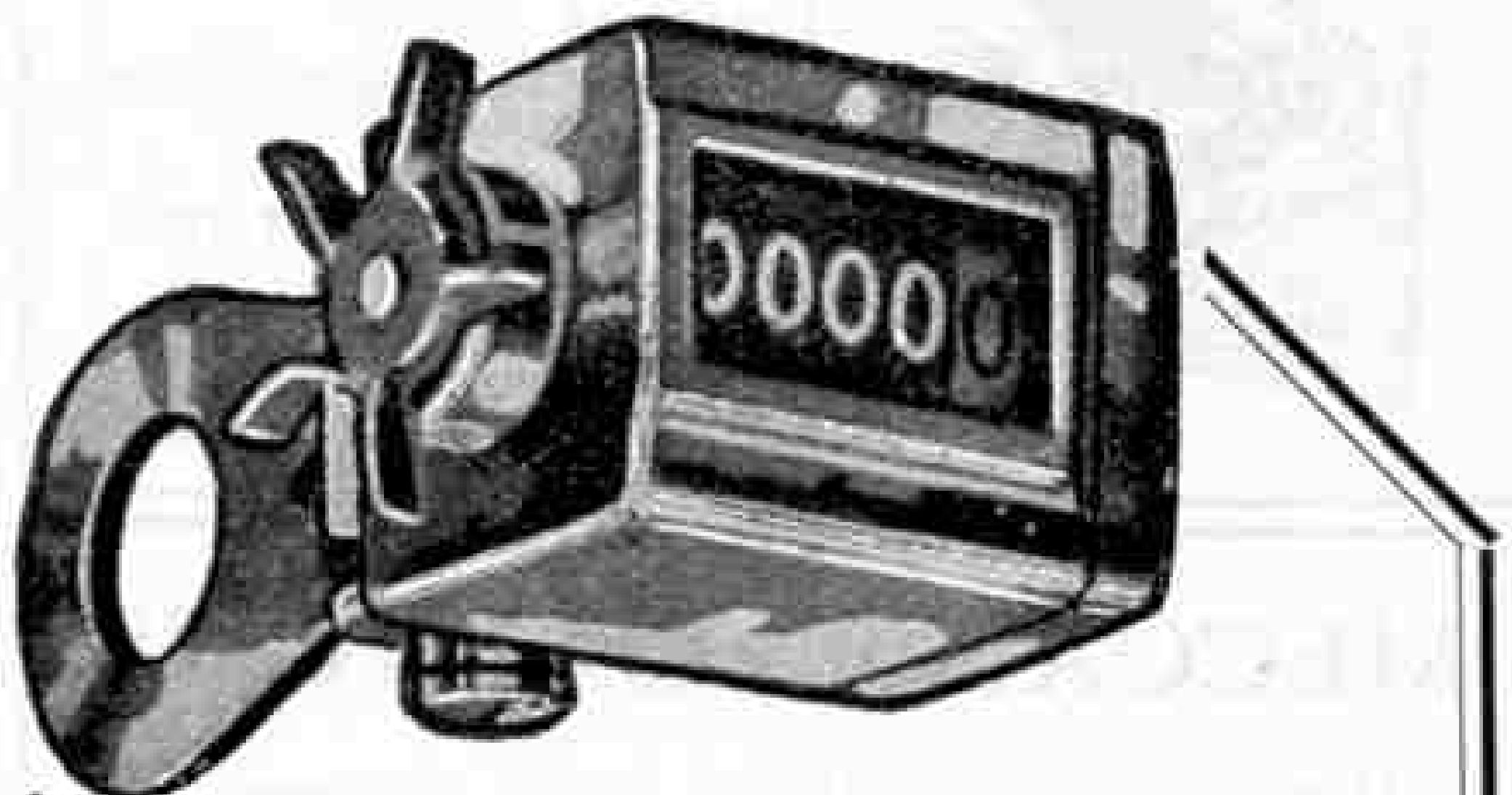

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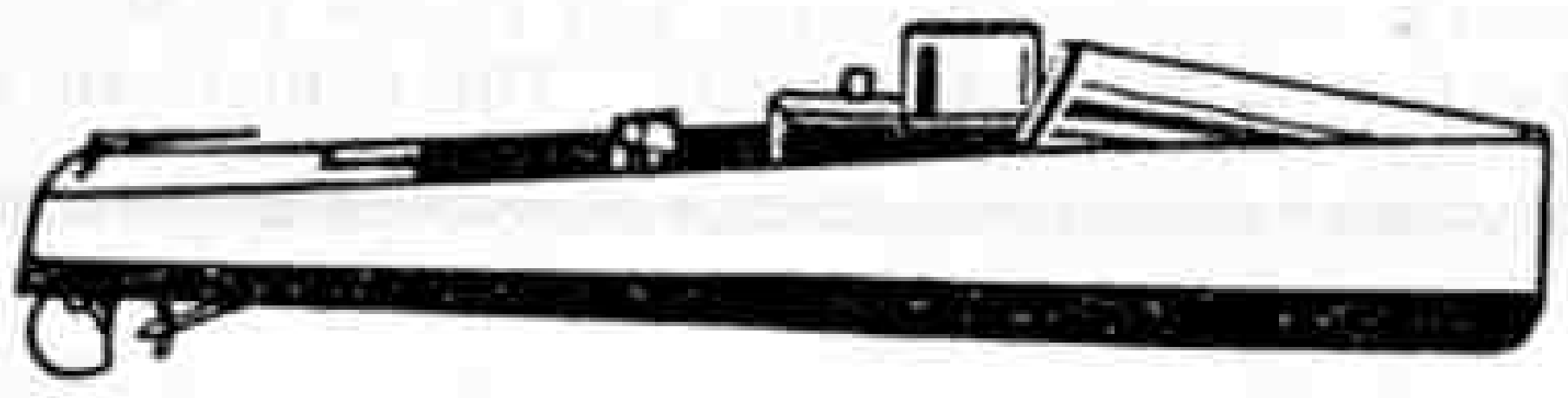

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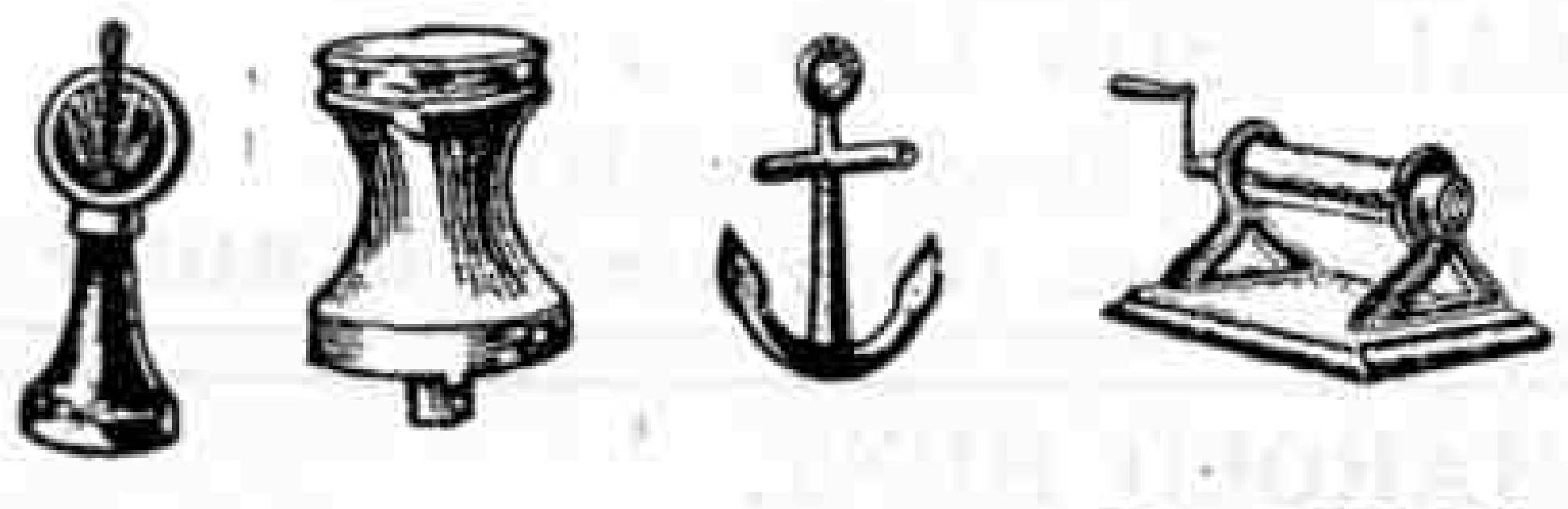

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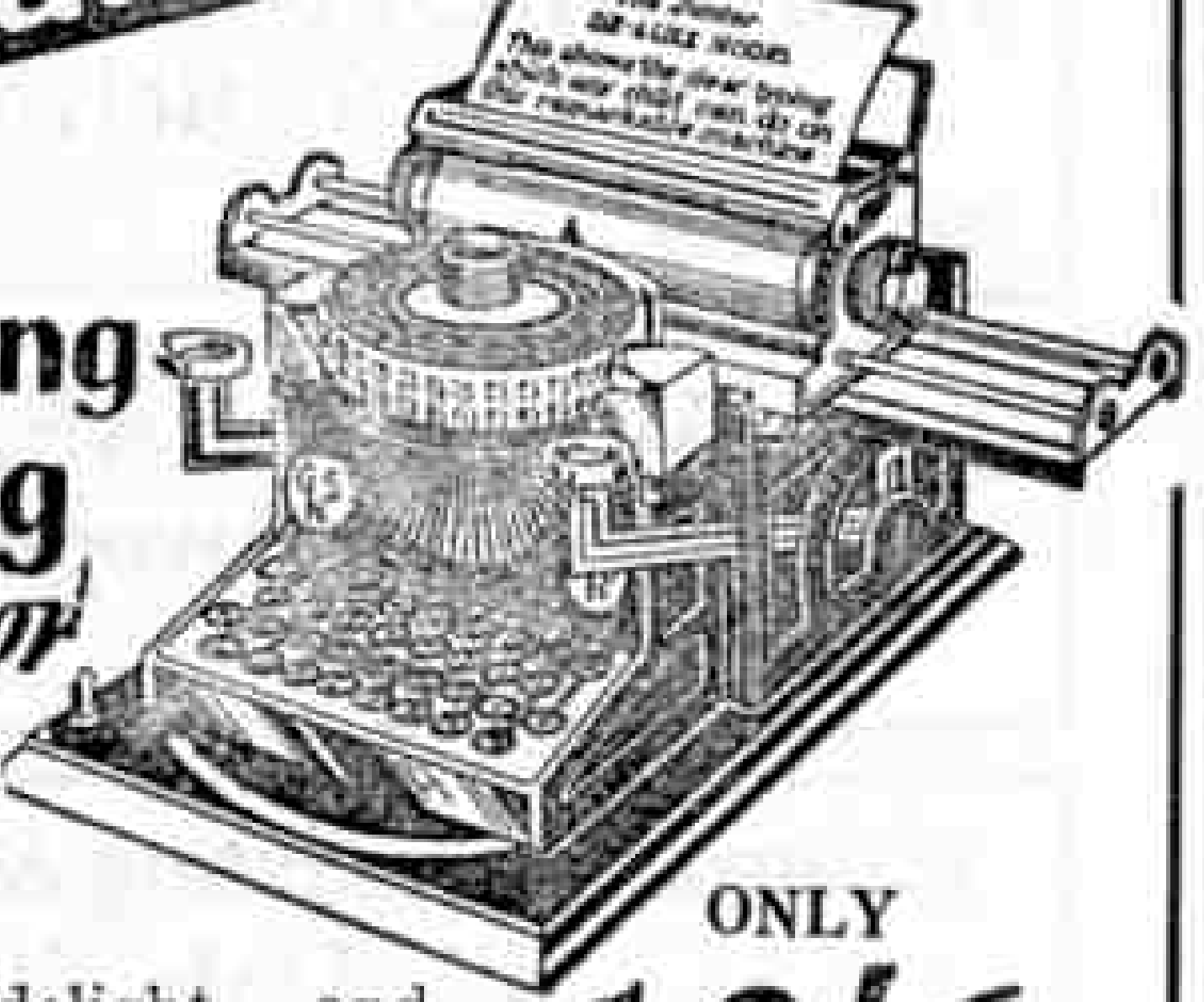

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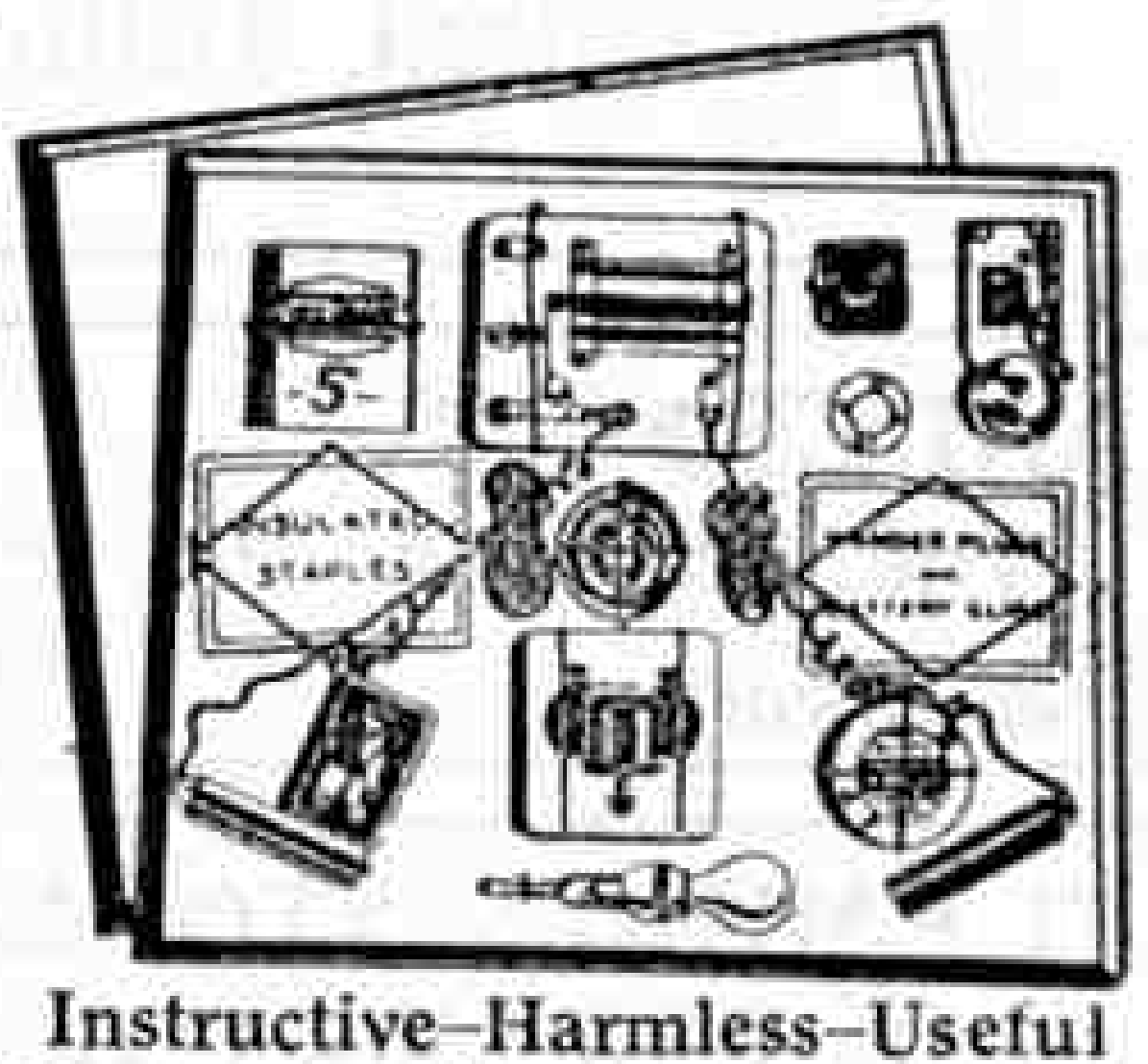

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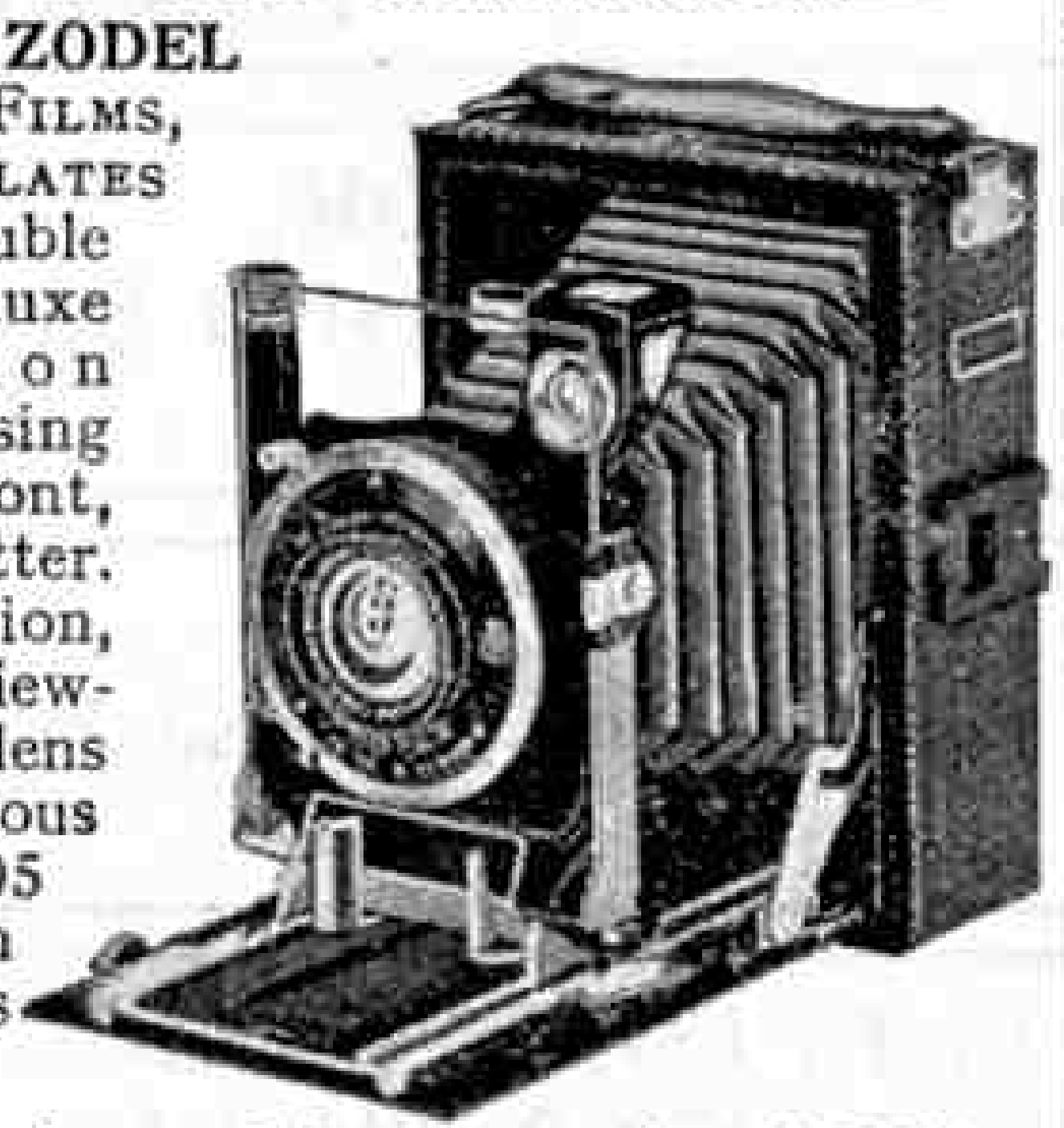

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The Centenary of the Dynamo—

(Continued from page 627)

for believing that the older man became a little jealous of the attention that was paid to his assistant. Circumstances compelled Faraday to act as Davy's valet for a time, and Lady Davy, who behaved badly to him almost throughout the tour, made matters worse by trying to keep him in a menial position. Faraday was not resentful, but behaved throughout in the steady, unruffled manner that in after life was so characteristic of him.

Faraday's peculiar situation gave rise to many difficulties. For instance, when the party were in Geneva they visited Professor A. de la Rive, a famous Swiss scientist. The professor soon discovered that the young man he at first thought to be Davy's servant was really his assistant in the laboratories at the Royal Institution, and invited him to dinner along with Davy. Davy thereupon declined the invitation, on the ground that Faraday in some respects held the position of servant. It is said that de la Rive remarked that the only difference this made was that he would have to give two dinners—one for Davy, and one for Faraday! He was very indignant at Davy's attitude, and finally ordered dinner in a separate room for Faraday. The incident was the beginning of a friendship between Faraday and de la Rive that continued without interruption until the Swiss scientist's death.

The tour concluded with a round of the chief cities of southern Germany and a second visit to Italy, where Davy and Faraday ascended Vesuvius, at a time when the famous volcano was very active.

Faraday returned to London in April 1815, and a fortnight later was re-engaged as an assistant at the Royal Institution at a salary of £1 10s. a week. The former bookbinder was now a well-travelled and accomplished scientist, who had made the acquaintance of the most distinguished Continental chemists. He had acquired a knowledge of several foreign tongues, and in the space of two years after leaving his old trade had thoroughly established himself in the respect of the men among whom he now figured. From this time onward he devoted himself to experimental work and lectures, and the story of the wonderful work that he carried out in the laboratories of the Royal Institution will be told in next month's issue.

READERS' SALES

Wanted, "Sexton Blake" and "Schoolboys' Own Library," January, 1927–June, 1930; "Magnets" and "Union Jacks," 1926 to 1930.—Wilmot, 11, Newbridge Hill, Bath.

Boys, have your own Private Stationery. Address printed on 36 sheets of fine Notepaper with 36 Envelopes to match, 1/-.—Swales, 23, Morningside, Bradford.

Sale. Clean "Meccano Magazines," 1926-28. 7/6, or offers. Refunded if dissatisfied.—S. C. Barrett, St. Neots.

Broken Sets of "*M.M.*," February–December, 1924; May–December, 1925; April–December, 1926. Complete sets for 1926, 1927, 1928. What offers? Box 801.

Sale. No. 7 Erector Set, perfect condition. Cost 45/-, sell 27/6, or nearest offer. Apply—D. Alfred, 111, Dartmouth Road, Cricklewood, London.

Latest Adana Printing Machine. Cost £3. Brand new. Best offer within seven days accepted.—Blaen, Treardden, Holyhead.

For Sale. Vest Pocket Kodak in Case. Cost 50/-. Sell 25/-. Perfect.—Mrs. Walker, Takoradi, Thorn Park, Plymouth.

Sale. Two Mice Cages, one metal, almost new, one wood. Particulars—234, Kew Road, Kew, Surrey.

Sale. Model Railway, Gauge 0, excellent condition, £5. Cost over £7. "Meccano Magazines," Feb. 1927 to Feb. 1930, less Jan. 1930, good condition, 12/6. Write—Moore, Rathfarnham, Co. Dublin, Ireland.

Offers? Meccano Magazines, 1924-30, perfect. M.R. Coach, Gauge 1. Cost 15/6. "Wenebrik," set 3. —Box No. 802.

Wanted. Cinematograph, Standard or Pathè Kid. Particulars.—Millman, 9, Swilly Road, Plymouth.

For Sale. 530 Good Foreign Stamps in Album. Best Offers.—49, Sherwell Hill, Chelston, Torquay.

For Sale. B.T.H. Wireless Set, one valve and two crystals. Excellent condition. Also pair of Headphones. Will take £2, or reasonable offer.—Harris, Lowery, Venn Grove, Hartley, Plymouth.

"Meccano Magazines," Feb. 1925 to Jan. 1928. Excellent condition. What offers?—J. J. Duke, Ilminster, Somerset.

Pathescope Kid Cinema, cost 55/-, sell for 40/-, quite new.—Tankshead, Blundel, Marine Drive, Rhyl.

New Stop Watch for sale, perfect order, 9/-.—M. Dawson, 6, Old Quebec Street, London, W.1.

Sale. Baby Adana Printing Machine, unused. Complete 9/6. Write—Carter, Brooklyn, Warley, Essex.

Wanted. Private Seal Coupons. Apply, quoting price per hundred, to R. M. Raith, Fishill, Craigie, Perth.

For Sale. Kodak Camera in good condition. Size 2¼×3¼. Film. Cost £2/7/6. What offers?—Box 803.

Sale. Eight Wonder Books; Post Cards (25 a 1/-); "M.M.s," Oct. 1925–June 1931; about 30 assorted Magazines. Best offers secure.—R. Whistler, Bridstow, Ross.

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How the World's Timber Supply is Produced

—(*Continued from page 611*)

secure manner, and many accidents have occurred through such rafts breaking up unexpectedly. At one time many of them were to be seen on the Mississippi, but they are not now often met with so far from the forests and mountains, for the sawmills have been moved nearer to places where timber grows.

At some of the lumber camps on the Columbia River, Canada, and in the north-west of America, the logs are built up into huge cigar-shaped rafts and are then towed to the sawmills by two steam tugs, one in front and one in the rear. A raft of this type is built up in a cradle moored in deep water, and when it is completed one side of the cradle is removed and the raft is launched sideways into the river. These rafts are sometimes as much as 600 ft. in length, 50 ft. across at the widest part and 30 ft. in depth at the centre, and contain nearly five million feet of timber. The logs are tied together with cable while the raft is being constructed, and when it is completed they are securely bound in a network of iron chains.

Timber felled during the winter months at lumber camps that are a long way from a river is often moved on sledges drawn by caterpillar tractors over tracks covered with ice, the slippery roadway being flooded daily in order to produce a new and unworn surface by freezing. In other cases logs are hauled on bogies mounted on light rails laid down for the purpose.

When trees growing on the slopes of mountains are being felled, the logs are often brought down to the sawmills or to the banks of a convenient river by means of "slides." These slides are merely channels of timber sufficiently wide to accommodate single logs, which slide down under the influence of gravity. A more picturesque method is to send the logs down a flume or channel into which water has been diverted from a convenient stream. A flume is nothing less than a timber aqueduct for, irrespective of the contour of the land, it descends the mountain side at a steady gradient made possible by carrying it over any deep hollows by means of timber embankments. The water rushes down the flume with great speed and the logs are rapidly carried along with it.

At many lumber camps in Canada and America narrow-gauge railways are now used to transport the sawn logs to the mills. The logs are hoisted up singly and are carried by an overhead wire cable system to the railway line, where a steam crane with a swinging boom loads them on to the flat cars of a "logging" train, one log on each car. The logging railway is carried across deep hollows by means of timber embankments built upon a foundation of timber piles.

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EDITORIAL AND ADVERTISING OFFICE:—
OLD SWAN, LIVERPOOL, ENGLAND.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/5 per copy (postage extra), and the subscription rates 9/6 for six months and 19/- for 12 months (post free); Canada, where the price is 15c. per copy, and the subscription rates 75c. for six months, and $1.50 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 34, St. Patrick St., Toronto.
UNITED STATES: Meccano Co. of America Inc., New Haven, Conn. Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Ltd., Kingston & Federal Streets, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Bombay Sports Depot, Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 13/C, Old Court House Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

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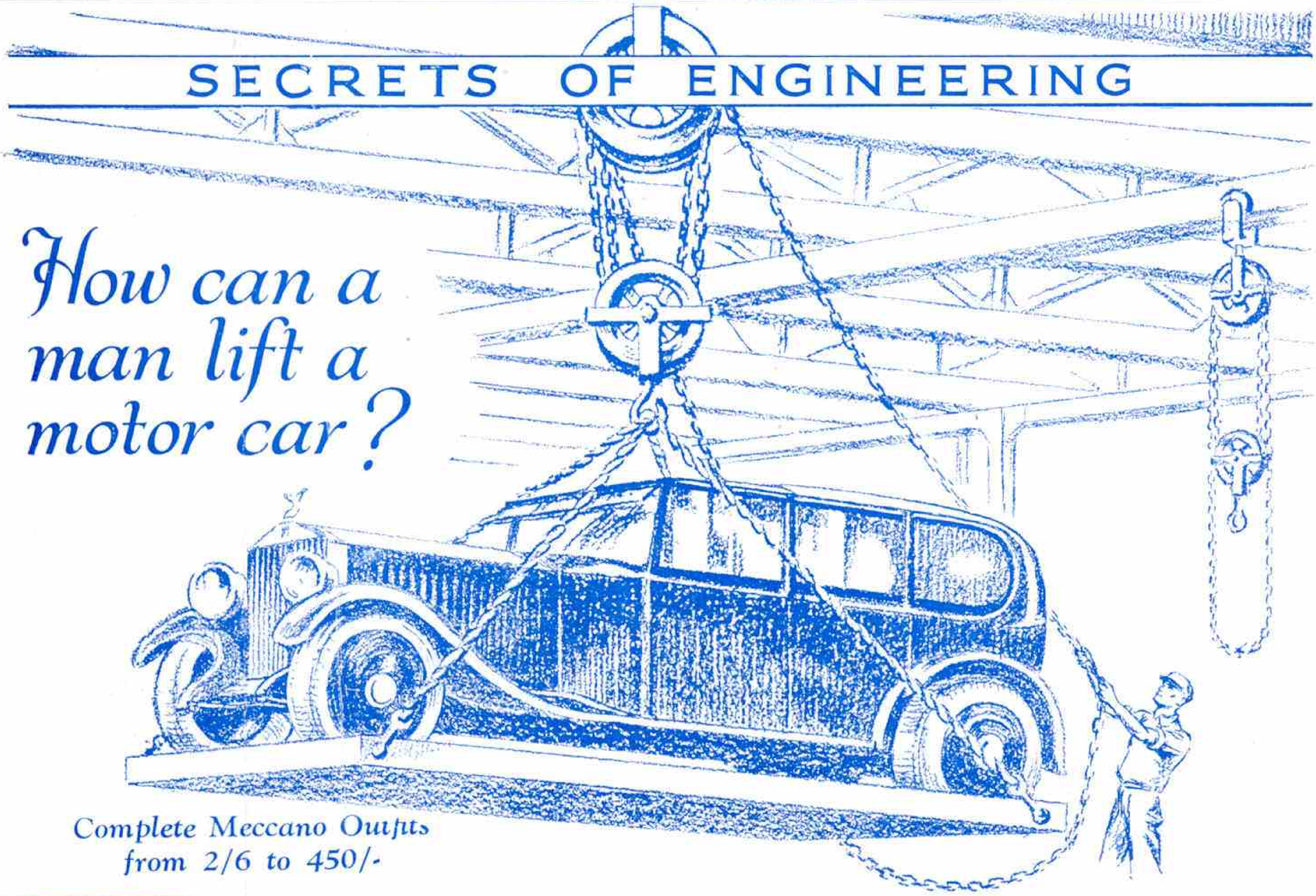

SECRETS OF ENGINEERING

How can a man lift a motor car?

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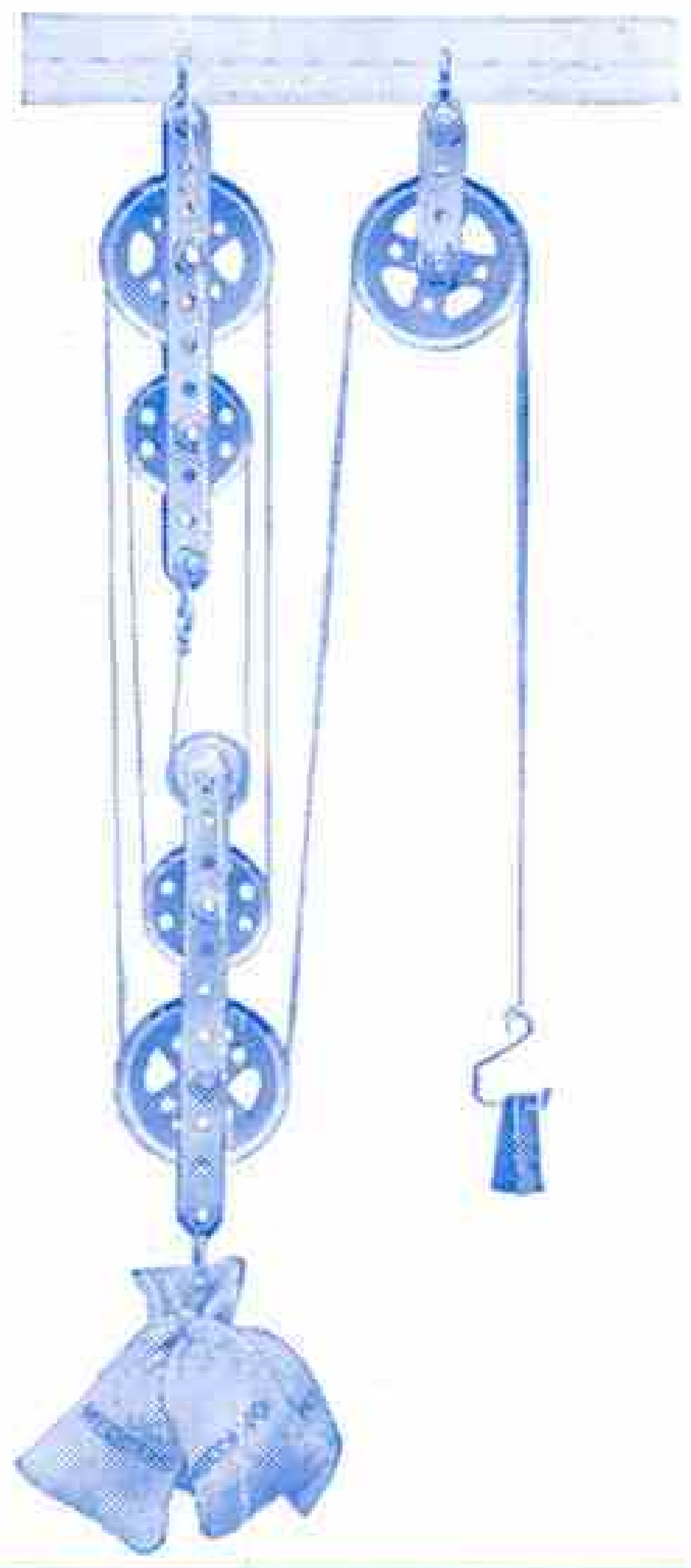

By means of blocks a man can lift without difficulty weights that he could not possibly move by his own unaided strength. The secret lies in the fact that the load is distributed over a number of sections of the chain or rope that passes continuously round the pulleys in the blocks. Power applied to the free end of the chain causes the lower pulley block and its attached load to rise, but only through a small fraction of the distance travelled by the free end of the chain. This decrease in speed is accompanied by a corresponding increase in power.

The illustration above shows the differential pulley block, or chain hoist, in which the chain is endless. This device has the important advantage of being self-sustaining, that is the load remains in position when the man ceases to haul on the chain.

Meccano Pulleys and Pulley Blocks may be used to demonstrate every possible arrangement of pulleys. Three examples are shown here, the one on the left being a perfect reproduction of the chain hoist by means of which the man in the top illustration is lifting the car.

All Meccano parts are real engineering parts in miniature—Girders, Pulleys, Gear Wheels, Pinions, Cranks, Couplings and scores of others. They can be used over and over again to build hundreds of different engineering models that work exactly as the real thing.

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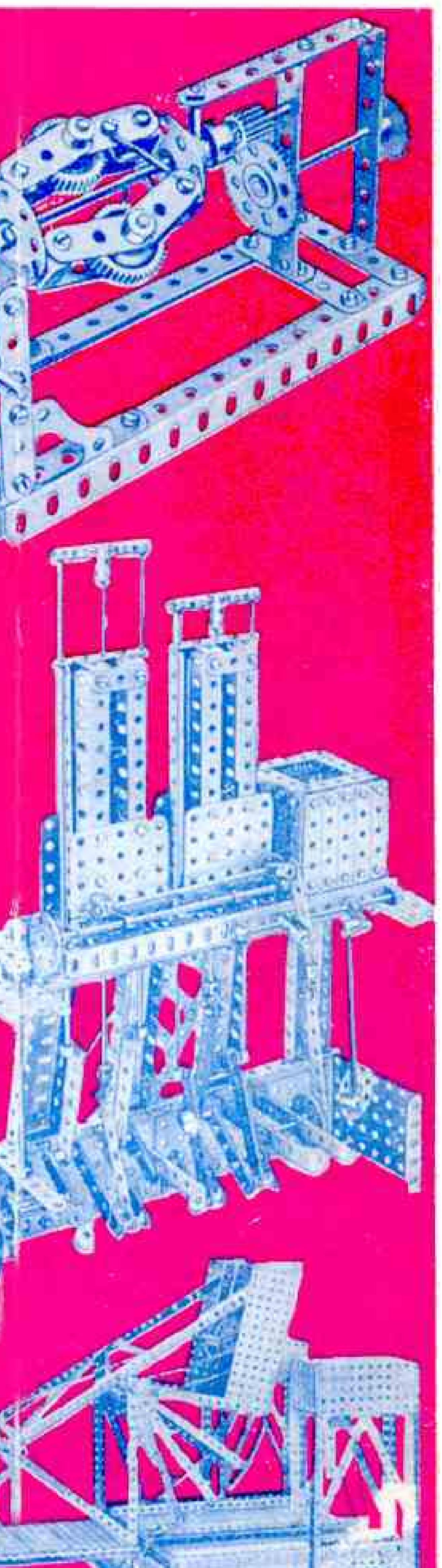

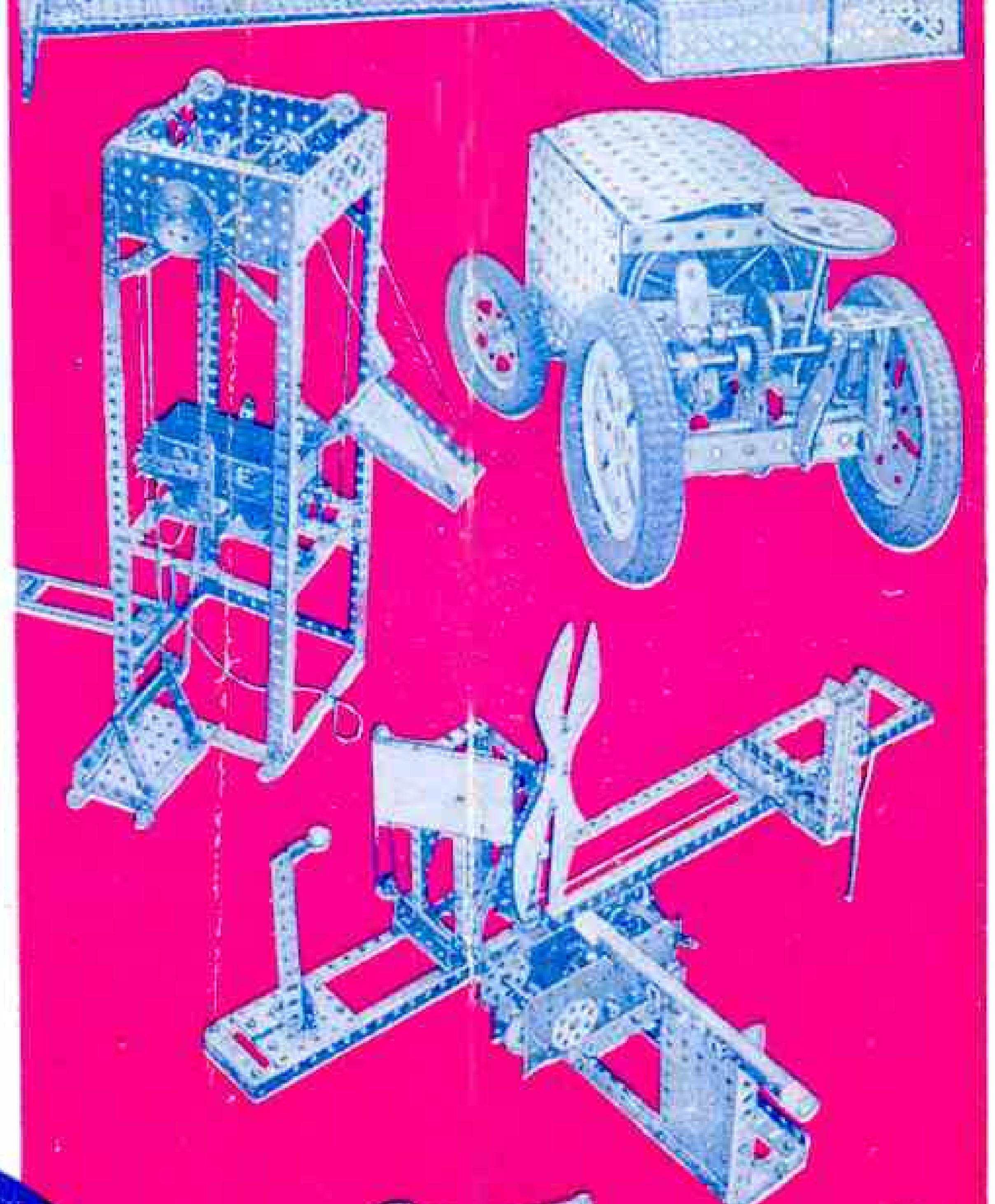

New Models—New Ideas

The 1931 edition of the Book of New Models is undoubtedly the most popular edition ever published. Nearly 20,000 copies have already been sold to enthusiastic Meccano model-builders, and orders continue to pour in. The new book consists of no less than 40 pages of new models, new mechanisms and new ideas, as compared with only 24 pages in all previous editions. Every Meccano boy should obtain a copy as early as possible.

The principal object of this book is to keep Meccano model-builders in touch with the latest improvements and developments connected with their hobby. The book contains illustrations and details of the best of the new models and new movements submitted in recent competitions, together with many others that have been designed by our own experts. The models shown in this book are of outstanding interest and variety. They range from simple models that can be built with small Outfits to elaborate types that will appeal to older boys.

How to obtain the book

The 1931 Book of New Models may be obtained from any Meccano dealer, price **9d.**, or direct from Meccano Ltd., Old Swan, Liverpool, price 10½d. post free.

There are special editions for Australia, New Zealand, South Africa and Canada and details of the prices of the book in these countries are as follows:—

Australia : Price 1/9 from dealers or 1/11 from E. G. Page & Co., 52, Clarence Street, Sydney. (P.O. Box 1832K).

New Zealand : Price 1/- from dealers or 1/2 from Models Ltd., P.O. Box 129, Auckland (Kingston Street).

South Africa : Price 1/- from dealers or 1/2 from Arthur E. Harris, 142, Market Street, Johannesburg. (P.O. Box 1199).

Canada : Price 25 cents from dealers or 30 cents from Meccano Ltd., 34, St. Patrick Street, Toronto.

Readers living in countries other than those mentioned above should order from Meccano Ltd., Old Swan, Liverpool, England, sending a remittance of 1/2 with their orders.

Get your copy to-day!

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